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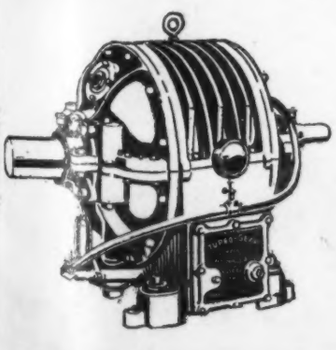

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Volume 76 New York, Saturday, October 9, 1920 *Number* 15

Brooklyn Edison Coal Case

AN INDICTMENT for conspiracy and violation of the Lever act has been found by the federal grand jury against the Brooklyn Edison Company and some of its executives. The company is charged with making improper use of its permits for priority deliveries of coal and with knowingly paying excessive rates for coal, which it is said to be hoarding. We have no desire to prejudge the case or to detract from the seriousness of the charge. The good name of a public utility and the integrity of men of high standing in the industry are called into question, and it is only fair that judgment be held in abeyance until the court has passed on the case. Formidable as every legal document appears, the probabilities are that the charges when sifted will be found to be groundless so far as the company and its officials are concerned.

Present-Day Profits

IN FACING demands for readjustment downward every manufacturer is forced to analyze anew his cost of production. Those who have profited by the unusual conditions brought about by the war must be content with a fair return and increase their turnover, while those who have suffered by unusual increases in the cost of materials and labor with a restricted output must be allowed to build back to the previous basis of profit. This means that prices in some lines will decrease and those in others increase until the distribution of labor and materials has righted itself under the law of supply and demand. Every electrical manufacturer, every wholesaler and every other agency associated with the production and distribution of products used by the electrical industry is placed on the defensive in the analysis of profits. Every executive, therefore, must do two things: Sharpen his pencil and refigure his costs on an economic basis, then resell to his customers on his existing price schedule or a changed price schedule in the light of legitimate manufacturing costs and legitimate profits. If every manufacturer in his marketing plans will make this a definite part of his program, the price adjustments in industry will be gradual and the individual manufacturer's position will be strengthened.

Future Public Utility Executives

EVEN though other industries offer higher initial remuneration to men who have just been graduated from technical schools, they will do well to consider the possibilities of the future in public utility work. When this country entered the world war the influx of technically trained men to this field practically ceased, and since then other industries have been able to offer such large salaries that the central stations have not been able to compete successfully for their share of the annual crop of engineering graduates. The public utility companies have been able to get along so far with the aid of the older technical men in their organizations, but this situation cannot continue for a long period, since it is from this group of employees that the future executive must be recruited. Consequently the central-station industry offers an attractive starting ground for young technically trained men, with the opportunities better now than next year, just as they should be better next year than the year following.

Civil Engineers Would Block Federation

THE civil engineers have submitted the question of joining the Federation of American Engineering Societies to their membership by letter ballot. Accompanying the ballot are two letters, one for and the other against joining the federation. The former is a conservative, sane and safe declaration. In the latter the claim is made that because the federation is not perfected the new body can never function properly. The real objection of the A. S. C. E., however, is to be found in this statement: "Should the society join the federation, it would, in the estimation of the public, cease to function as the leading engineering organization, as it has done for sixty-eight years." The reasoning sounds familiar. We recall when the Engineering Societies Building was erected and the Engineering Foundation formed that the same objection was raised. The civil engineers would not join because they had a home of their own and they were afraid of losing their identity. When later it was found that aloofness brought isolation they applied for admission. Who, then, are leaders? Those who do things, those who build! Leadership connotes action, not reaction, and those who would aspire to it must be constructive. The federation to be of value must include all engineers and the "civils" must do their part to make it an effective organization.

Principles of Sound Utility Financing

TWO opposite motives rend the breast of the average citizen when he has money in large or small amounts to invest—the gambler's impulse, so hardly suppressed by frail humanity, to strike for large profits at whatever risk and the prudent man's desire for an assured return on a stable property. Few electric utility managers, we think, could be found to dispute the assertion made by H. M. Addinsell, in the paper on "Central-Station Financing," part of which we print this week, that the day of possible large speculative profits in the securities of public service companies is past. It departed with the nation-wide acceptance of the principle of regulation by public service commis-

sions. With its departure the way was cleared for universal recognition of the facts on which Mr. Addinsell lays stress—that these companies are, in his own words, "an indispensable and permanent part of the economic structure of the communities they serve," and that their stock and bonds partake and will increasingly partake of the nature of quasi-municipal securities. As such it is self-evident that public utility issues offer a particularly attractive investment to the small buyer, always provided that they give a rate of return enough higher than that borne by national, state and municipal bonds to place them, from his point of view, firmly on the middle ground between government securities with their low interest and those of corporations engaged in private and competitive enterprises with their uncertain features. Mr. Addinsell, who speaks as an investment banker, points out that it is on this class of buyers, in addition to their own customers and neighbors, that public utilities now depend; he explains why this fact makes necessary in mortgage bonds certain limiting clauses seemingly uncalled for; he dwells on the difference between the old form of sinking fund and the new, and he makes a conservative statement concerning the proper ratio of debt to capitalization and of earnings to bond interest, placing both at two to one. His paper deserves the careful attention of central-station executives.

Illumination Design Involves More than Geometry

THE foot-candle meter has put in the hands of the engineer a most convenient and satisfactory method for checking results in illumination. No one who has not used the instrument can half appreciate the facility with which approximate results may be reached. In the current issue Messrs. Samuels and von Dannenberg give the results of a study of illumination design in which the foot-candle meter measurements play a somewhat unusual part.

The particularly interesting feature of the study is in the treatment of semi-indirect and indirect lighting where the equivalent foot-candle curve for a single fixture is obtained photometrically with the fixture *in situ* and the results then applied in the same general way as if the case were one of direct illumination. One can even go further and obtain an equivalent polar curve by the same method. The author's general method of design is that of point-by-point integration simplified by tables. To those accustomed to work in terms of light flux the method may not appeal, but as a check on very approximate calculation the method explained may often prove valuable. If any one prefers working from curves rather than from tables, curves can be found in our issue of June 19, 1920, covering substantially the same ground.

It would be exceedingly interesting for the illuminating engineer to take some typical installation, compute the illumination by several of the methods in common use, and finally to compare results with the photometric measurements within the area illuminated. The result, however, might not be altogether conclusive, since as a matter of fact the geometry of the illumination is so small a factor in the substantial application of the art. It takes the facility of the slide rule plus the wisdom of the serpent to lay out a thoroughly successful system under any conditions other than the most conventional. Physiology and psychology play their parts in the problem to an extent that the tyro fails to grasp and which frequently puzzles the adept. Questions of shadow, of direction and of relative brilliancy of surfaces are sometimes so important as to overshadow most other considerations, and after these are judiciously dealt with there still remains what our psychological friends call the "affective" factors, which now and then prove to be dominant. The mere question of tint is far from negligible, quite aside from theorizing as to the coefficients of reflection, and in anything except the baldest kind of industrial lighting illumination as an art overshadows illumination as a science.

Boiler-Room Instruments Essential to Economy

AS THE art of developing electric power has progressed the necessity of tracing the energy through to the busbars has been more and more appreciated as a check on efficient operation. The thoroughness with which all the transformations and losses of energy can be watched today is put well in evidence by papers like that of R. E. Dillon, which was published Sept. 25, setting forth the apparatus which is actually in advantageous use. The bigger the station the larger the amount at stake and the bigger the investment justified in auxiliary testing apparatus. To generalize the whole problem for the benefit of all classes of stations, big and little, one must begin to classify things according to their relative importance from a dollars-and-cents standpoint.

First of all, it is absolutely necessary to keep track of the coal put into and the energy taken out of the plant. The integrating watt-hour meter and the coal scales may therefore be regarded as imperative requirements. Of these the coal scales are the more often neglected. It is not necessary that the weighing apparatus should be continuous and automatic, but it is of the utmost value that the amount of coal per hour as well as per day should be estimated with considerable accuracy.

To obtain the largest number of kilowatt-hours per B.t.u. it is essential to study the losses along the route from the coal pile to the busbars. In this analysis the facilities for studying the efficiencies of conversion of coal energy to steam energy have too long been neglected, but it is encouraging to see a tendency toward the use of more measuring devices in the boiler room. The fundamental factor required is the evaporation of the boiler reduced to standard conditions per pound of coal fired reduced to combustible. This figure establishes the gross boiler efficiency. The steam meter should be combined with measurements of steam temperature, and the water measure of course with its own measure of temperature. Any failure of proper evaporation means trouble with furnace or boiler. The flue-gas temperature and the CO_2 recorder help to locate the cause. When the combustion is good as indicated by the latter, the former gives some very suggestive information as to condition of the boiler surfaces. It is unfortunate, however, that the continuous CO_2 recorder, which furnishes very valuable information, is, generally speaking, a somewhat delicate piece of apparatus and none too responsive to changes, resulting from rapidly changing firing conditions.

Such in the rough are the data up to the prime mover. Then one can start back from the generator,

in which the losses, being small, can be estimated very closely, and detect any failure of the prime mover to utilize its steam properly. At this point come the measurements on the condensing equipment. All these data can be obtained in a large plant without great difficulty or forbidding expense.

Utility Rates and the Bonus System

APPLICATION of the fundamental principles of the bonus system to the rates for the service rendered by a public utility is as logical in its conception as is their application to the pay of a riveter. A riveter of ordinary skill and ordinary health is thought to be worth a definite wage at the start, but if he climbs above the ordinary level by increasing his skill and carefully looking after his health, so that he can work more quickly and energetically, he is rightly entitled to proportionately increased pay. He knows this when he starts the week's work, and on pay day his efficiency has been calculated and he receives his pay without argument. His employer is satisfied, for although he has paid more total wages in the period, he has obtained service in full measure and he has made more money.

Few public utilities are rewarded adequately for more than ordinary efficiency, yet what is more reasonable than that a set basis be arrived at upon which they shall receive ordinary returns and that, exceeding this, they shall be rewarded in proportion? At present they do not know with any degree of certainty whether it will be reward or penalty that any twelve-month period will bring. If a highly efficient service is rendered because of the foresight of their managements and the skill of their workers, they have no positive knowledge that there will be sufficient revenue to pay the wages that such foresight and skill demand elsewhere. And if they do show such a revenue and something over, experience has shown that more often than not the entire additional pay is returned to their employer—the public. Electric service is a modern institution and its control and regulation must become modern. The utilities and the public are entitled to know in advance what the rewards for efficiency or the penalties for carelessness will be.

Efficient Use of Oil Fuel

THAT the use of fuel oil promotes boiler and furnace efficiency when skillfully carried out is pretty well established, but the exemplification made in the article beginning on page 730 is a particularly encouraging one from the practical standpoint. In the plant referred to the proper relation between oil and air pressures—the two variables in operation—was determined for the whole range of capacity by analysis of combustion gases. With these facts as guide no difficulty was experienced in maintaining complete and smokeless combustion, and it proved possible to hold the boilers up to nearly 300 per cent of their nominal rating while still maintaining extremely high efficiency. In fact, the efficiency was held above 80 per cent from normal load up to 293 per cent of the rating, a very extraordinary figure for a boiler and furnace working under even the most favorable conditions. The tables of performance given show the details of the situation and how extraordinarily good was the combustion.

No correction is observed for the energy required to heat the oil to the 230 deg. Fahr. at which it reaches the boilers, or for that necessary to work the pressure pumps which feed the oil to the burners. This, of course, is not a factor of the boiler efficiency as such, any more than is the power required to work the ordinary auxiliaries, but it is a net loss which has to be evaluated in considering the economic results.

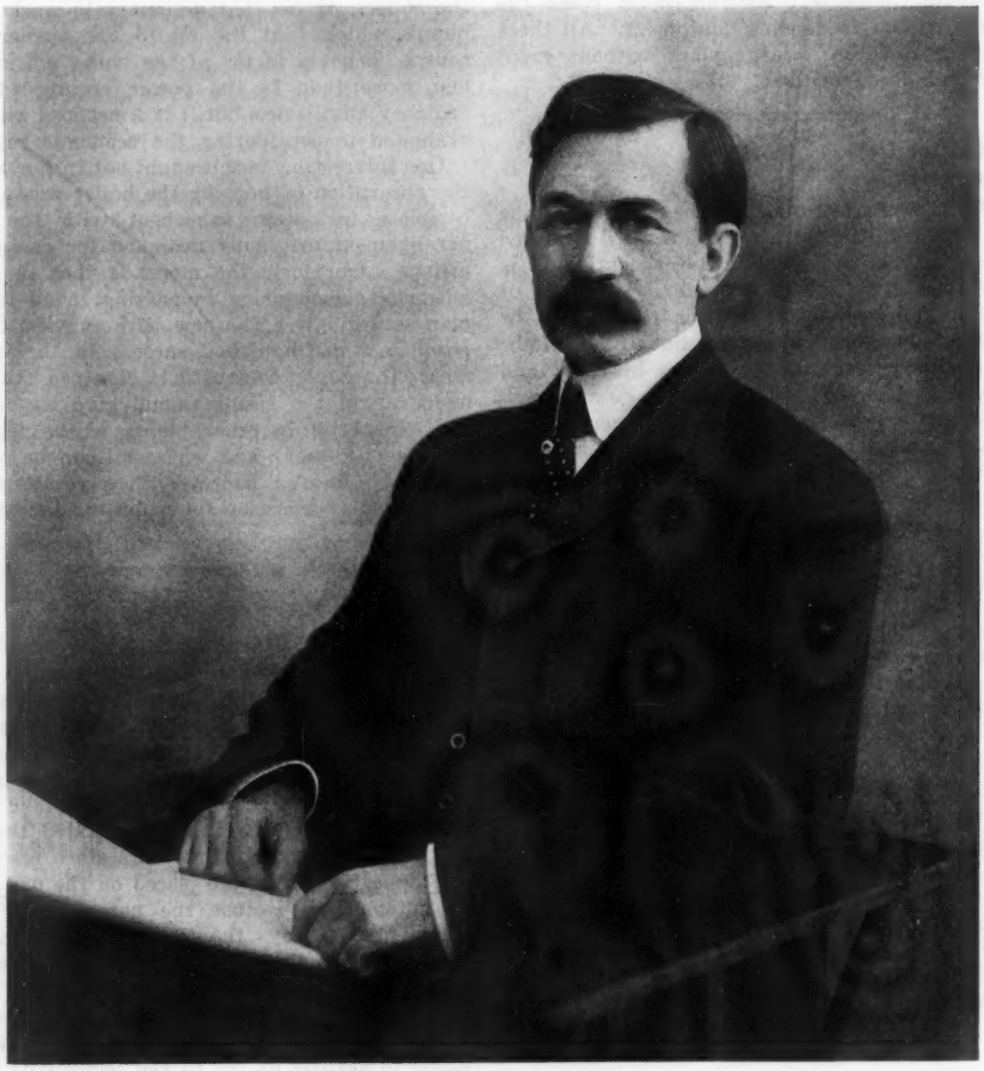
One interesting fact brought out in the tests was that the absorption of heat by the boiler was altogether too complete to obtain superheat with the superheater arrangement originally designed for coal-burning conditions. Obviously the moral is that in order to get adequate superheating in passing to oil fuel one must plan accordingly. The new burners seem to have made possible a distinguished success in the intensive and most thorough combustion obtained through their agency, and the result should give encouragement to the use of oil in other plants where forcing boilers becomes necessary and where oil can be obtained at a reasonable figure. However, these results should not be considered justification for widespread substitutions for coal.

Community Has Prior Rights on Highways

STRICT enforcement of rights derived from prior occupation of highways as between public utilities may result in actual detriment to the community. This is a thought that those engaged in solving the problems developed by the use of the highways by utilities must keep in mind. Highways exist for public convenience, and public needs have always dictated the manner of their use. It is not many years since restrictions that now appear absurd were placed on the use of highways by automobiles because the horse-drawn vehicle was dominant. Today the restrictions that exist are designed to maintain the most advantageous use of highways by all kinds of conveyances. That horse-drawn vehicles have superior because prior rights no sensible man would maintain, since to apply such a rule would result in serious injury to the community.

The same principle that has governed the development of vehicular use applies to the use made by public utilities. The question at issue between utilities is not one as to the rights of two parties but one concerning the rights of three parties, the third party having provided the highway for its own convenience and not for the convenience of individuals. In any question of priority of rights on highways the public alone holds priority, and the rights of utilities will hold only so far as they do not prove detrimental to public interest. An interesting example of the manner in which this principle works out is the existing tendency observable where rural distribution lines are being demanded. The tendency in the past has been to penalize distribution lines for interference with ground-return telephone circuits.

With the constantly growing realization of the value of central-station service has come the realization that such penalization is a bar to obtaining the desired service. The result is the collapse of attempts to protect obsolete telephone practice at the expense of another utility. The interested public has discovered that its prior rights demand a better treatment of the problem.



James Gilbert White

An engineer of international reputation who early recognized the commercial possibilities of electricity and who has developed a great organization to finance, to build and to operate

THIRTY years or more ago, when the commercial use of electricity was in its infancy, it required unusual courage for engineers to try out new ideas, but those who dared and were successful have been well rewarded. Among these is J. G. White. His wide vision, added to his natural ability as an organizer and builder, has made for him an enviable position in the field of public utilities. When the electric street railway was being urged as the successor to the horse-drawn car Mr. White was one of its most active supporters. In 1895 he built the road which was to set the standard for modern interurban electric traction systems. This was a high-speed line from Buffalo to Niagara Falls, and so far as can be learned it was the first to use the four-motor equipment with series-multiple control. To him is given the credit for demonstrating in a practical installation the effectiveness of the three-wire principle with 220 volts on each side. This successful demonstration was made early in his career at Kearney, Neb.

It was really the Buffalo-Niagara Falls installation, which included the building of a transmission line with what was then a record capacity—5,000 hp.—that brought Mr. White into engineering prominence. Since then commissions have come to him from every part of the world. A compilation of the projects with which he or his company have been associated includes thirty-one hydro-electric developments and fifty-five steam-power plants with a combined ultimate capacity of 1,060,915 hp., seventy-one traction systems having a total mileage of 1,768, twenty-four transmission systems with a total mileage of 1,399, besides much other work.

Mr. White was born Aug. 29, 1861, at Milroy, Pa., and at the age of twenty was graduated in the arts course from the Pennsylvania State College. He then took up engineering at Lehigh and later at Cornell, from which institution in 1885 he received the degree of doctor of philosophy, having specialized in electricity. During the next two years he was instructor in physics in the University of Nebraska, and in 1887 with others joined in organizing the Western Engineering Company, which three years later was sold to the Edison-United Manufacturing Company, with which he was associated for a short time. He resigned to develop an engineering business under his own name. This business has expanded into one of international scope and includes a utility management division and an engineering division, each now conducted by a separate subsidiary corporation. This success of Mr. White in public utility management and operation probably is due more than anything else to two qualities not often manifest in the same individual, his financial ability and his constant recognition of the necessity for having and holding the public good will.

Designing Direct and Indirect Illumination

(Copyrighted, 1920)

Practical Method of Determining Illumination in a Given Plane for Either Direct or Indirect Fixtures and an Original Scheme of Calculating Foot-Candle in One Horizontal Plane from Values Obtained in Another

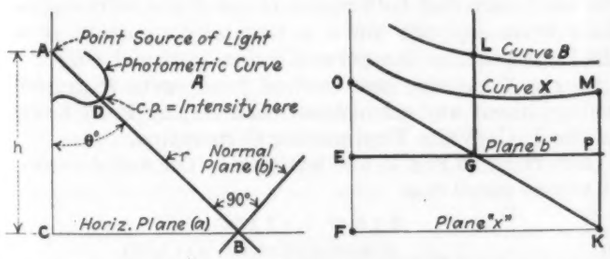
By M. M. SAMUELS and C. O. von DANNENBERG
Electrical Division J. G. White Engineering Corporation

SINCE the introduction of the foot-candle meter means have been placed in the layman's hands whereby he can easily check a lighting installation as to its distribution and efficiency. Therefore it is no longer sufficient for the lighting engineer to determine the types and spacings of fixtures for a particular installation by rough assumptions and practical guesses.

While the problem of predetermination is comparatively simple where direct reflectors are used, it becomes intricate and very difficult for indirect or semi-indirect fixtures. Even with direct reflectors, however, accurate methods are not yet sufficiently used and some of the practical short cuts which simplify the problem and save a great deal of tedious and monotonous detail figuring are not appreciated. Short cuts developed by the authors are therefore outlined here and some new practical methods are suggested which the authors have worked out for the predetermination of indirect or semi-indirect illumination.

The well-known fundamental law upon which all lighting estimates and measurements are based will be briefly stated as an introduction to the subject. In Fig. 1 *A* represents a point source of light. If on a light beam *AB* at an angle θ to the perpendicular at a distance of one foot from light point *A* the photometer reads *cp.* candlepower, then the illumination on a plane *b* which is perpendicular to the beam *AB* at a point *B* where the beam strikes the plane *b* is $cp./(AB)^2$ foot-candles. If the distance *AB* is termed *r*, then the illuminations on plane *b* at point *B* is $cp./r^2$.

On the horizontal plane *a* the illumination at the same point *B* is then $(cp./r^2)\cos\theta = (cp.\cos^3\theta)h^2$, where *h* is vertical distance from light point *A* to plane *a*. The term $(\cos^3\theta)h^2$ is commonly known as the "multiplier," and its values for all horizontal and vertical distances within practical working limits have been worked up in the form of tables which may be found in "Railway



FIGS. 1 AND 2 — METHOD OF DEVELOPING FOOT-CANDLE CURVE FOR A CERTAIN PLANE FROM THAT FOR ANOTHER

Illumination on plane *b* at *B* equals $cp./r^2$; on plane *a* at *B* it is $(cp.\cos^3\theta) \div r^2$.

Electrical Engineers' Handbook," by C. W. Bender, as well as in the bulletins of the engineering department of the National Lamp Works of the General Electric Company. The angles for various horizontal and vertical distances may be found in the same sources. I. W. Gross has replaced these tables by curves which serve the same purpose. (See ELECTRICAL WORLD, June, 19, 1920.) The experience of the writers, however, is that the tables are much handier than the curves.

For non-transparent metal reflectors the manufacturers generally furnish "real" polar curves, which are determined in the laboratory by photometer readings

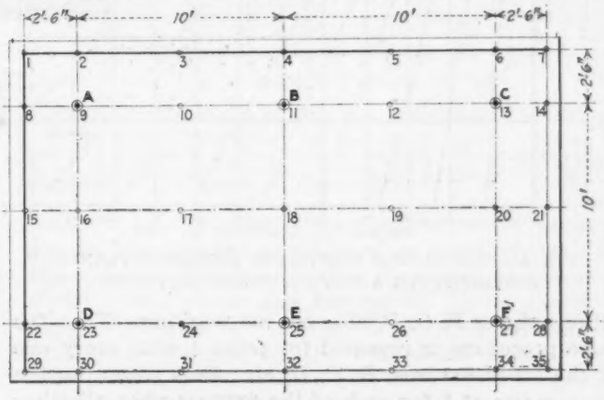


FIG. 3—TYPICAL DISTRIBUTION OF FIXTURES IN A ROOM

and which give the candlepowers for the particular shade and a particular size of lamp as a function of the angles which the particular light beams form with the vertical. The candlepower values given in these polar curves (curves *A* in Figs. 1 and 4), having been derived by actual photometric measurements, may be considered as equivalent to integrations over the full surface of the reflector and are used as if the light, instead of coming to each point from all points on the reflecting surface, actually came from a point source which is located approximately in the center of the lamp filament and which may be called for practical purposes the focus of the fixture.

USUAL PROCEDURE FOR DIRECT REFLECTORS

If a design is required for an illumination by direct reflectors, the procedure is as follows: A certain type of reflector with a given polar curve is assumed. The experienced illuminating engineer will easily select by experience the reflector which will approximately meet his requirements. A certain spacing of the fixtures as well as a suitable elevation is next assumed, also by experience. Then a certain number of points (1, 2, 3, etc., in Fig. 3) are selected for the purpose of determining the illumination.

In order to determine the illumination, for instance, at a point 1 in Fig. 3, the horizontal and vertical focal distance must be measured from point 1 to fixture *A*. For each horizontal and vertical distance the angle θ is found from the appropriate table or curves. For this particular angle θ, the candlepower value (cp.) is taken from the polar curve "*A*" in Fig. 1 or Fig. 4 and multiplied by the multiplier, which may be obtained from the tables or curves, the product giving the illumination in foot-candles at point 1 on the particular horizontal plane illuminated from fixture *A* only and assuming that all

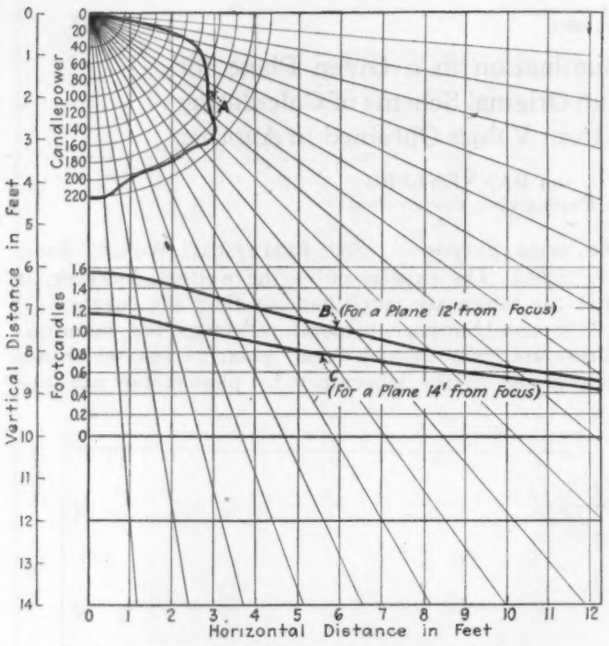


FIG. 4—FOOT-CANDLE CURVES FOR DIFFERENT PLANES DEVELOPED FOR A SPECIFIC DIRECT REFLECTOR

other fixtures *B*, *C*, *D*, etc., are not working. Then the same procedure is repeated for point 1 with every one of the other fixtures, *B*, *C*, *D*, etc., thus obtaining the foot-candles at 1 for each of the fixtures when all other fixtures are not working. The addition of all these foot-candle values gives the actual total foot-candles at point 1 when all fixtures are working at the same time.

The same procedure must be repeated for all other points 2, 3, 4, 5, etc. The more points used the more accurate is the analysis.

The procedure which is generally used by those engineers who desire to estimate illumination correctly is very tiresome and can be considerably simplified by the method which follows:

SIMPLIFYING CALCULATIONS FOR DIRECT FIXTURES

In the majority of cases all fixtures in a room will be of the same type and will be suspended at the same vertical distance from the plane of illumination. Table I may, therefore, be calculated for the particular fixture for various horizontal distances from the fixture and the given vertical distance from same. Curve *C* in Fig. 4 may then be plotted, and the foot-candle values for each point from each fixture in foot-candles can then be taken from this curve by simply reading the foot-candle values for the respective horizontal distances. This curve *C* can be kept on file and used in the future at any time when the same fixture is used at the same elevation, even though the spacing may be different, without the necessity of any tables or calculations.

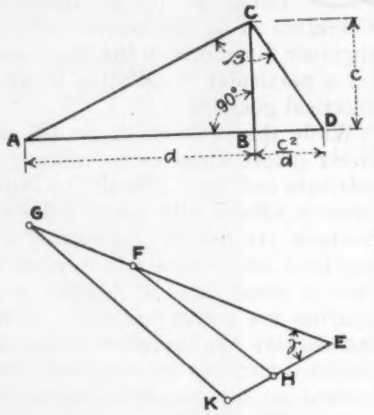
TABLE I—VERTICAL DISTANCE FROM PLANE OF ILLUMINATION 12 FT.

X—From Bender's tables; Y—From Bender's tables; Z—from curve *A*; W—Y.Z. foot-candles.

Horizontal Distances	X Angle	Y Multiplier	Z Cp.	W F.C.
0	0	0.00694	224	1.55
1	4° 46′	0.00687	222	1.53
2	9° 28′	0.00668	216	1.44
3	14° 2′	0.00634	206	1.31
4	18° 26′	0.00593	204	1.21
5	22° 37′	0.00546	204	1.11
6	26° 34′	0.00497	204	1.01
7	30° 15′	0.00448	204	0.92
8	33° 42′	0.00400	204	0.82
9	36° 52′	0.00356	206	0.73
10	39° 48′	0.00315	209	0.66
11	42° 31′	0.00278	213	0.59
12	45° 0′	0.00246	214	0.53

A graphic method for plotting curve *C* from curve *A* was developed by Dr. Robert Böker (see *Elektrotechnische Zeitschrift*, Jan. 8, 1920, page 25.) This method might be used should no tables be available, but its application is extremely tedious as well as cumbersome, and its practical utility is doubtful when the N. E. L. A. tables are available.

But even for cases when the same fixture is used at a new elevation the authors have devised a method to obtain curves for any elevation if a curve is already available for a given elevation.



FIGS. 5 AND 6—GRAPHIC METHOD FOR CONSTRUCTING FOOT-CANDLE CURVES FOR DIFFERENT PLANES

In Fig. 2 let *B* be a curve already developed for a certain fixture for a horizontal plane *b*, having a vertical distance *OE* from focus *O*; it is desired to develop a similar curve *X* for another plane *x* having a vertical distance *OF* from focus *O*. On any radius *OK* let $OG = c$ in feet and $OK = d$ in feet. Furthermore, let $GL = a$ = foot-candles at point *G* on plane *b* and $PM = x$ = foot-candles at point *K* on plane *x*; then $x = (c^2/d^2)\ a$.

Thus a number of radii may be drawn from *O*, the values *d*, *c* and *a* scaled, and thus the values *x* calculated and curve *X* plotted.

In Fig. 4 curve *B* was plotted by first calculating the values in Table I. Curve *C* was then developed from curve *B* by applying the method just described. Particular attention must be called to the fact that the relation between curves *B* and *X* (Fig. 2) given above is for the same light beam and not for the same horizontal distance from the fixture. Thus the value $x = PM$ is developed for a horizontal distance *FK* from the value $a = GL$, which is for a horizontal distance *EG*, for the reason that both points *G* and *K* are on the same light beam and only for a horizontal distance of *O* is the light beam in the perpendicular (*OE* and *OF*).

Curve *X* has also been derived from curve *B* graphically, without any calculation whatever, by Ford Kurtz of the J. G. White Engineering Corporation.

Referring to Fig. 2, and letting $c = OK$ and $d = OG$, it will be noted that

$$a : x = 1/c^2 : 1/d^2$$

or

$$x/a = c^2/d^2 = (c^2/d)\,(1/d)$$

or

$$(x/c^2)/d = a/d.$$

In Fig. 5 make $AB = d$, then draw the perpendicular *BC*, making $ABC = 90$ deg. and $BC = c$. Then connect *A* with *C* and erect at *C* a perpendicular on *AC*, making $\beta = 90$ deg.; then $BD = c^2/d$.

Then draw any angle (γ in Fig. 6), and make $EF = d$ and $FG = a$. Then make $EH = c^2/d$, taken from Fig. 5. Connect *F* with *H* and draw a line through *G* parallel to *FH* and intersecting continuation of *EH* at *K*. Then $HK = x$.

From curves *C* and *B* in Fig. 4 it is easy to work up

Table II, giving total foot-candles for each of the points 1, 2, 3, etc., with all fixtures *A*, *B*, *C*, *D*, etc., working in a room shown in Fig. 2. In the particular case illustrated the values are given for two different planes of illumination, one 12 ft. (3.6 m.) below the focus of the fixture, derived from curve *B*, and the other 14 ft. (4.2 m.) below the focus of the fixture, derived from curve *C* (Fig. 4).

With the values obtained from Table II, it is now possible to plot curves giving the actual distribution of illumination throughout the room on a horizontal plane. Such curves are given in Fig. 8. For some purposes this distribution would be sufficiently satisfactory, whereas for other purposes it would not be uniform enough. It will easily be seen that even though the fixtures are pretty close to the walls the illumination drops off considerably along the wall. Actually the illumination is somewhat more uniform than the curves indicate owing to the reflection of ceilings, walls, etc. If, therefore, a more uniform distribution should be required, it would be necessary either to select a different type of reflector or to install bracket fixtures along the wall to make the necessary corrections in the curves.

How Method Is Applied to Indirect and Semi-Indirect Reflectors

The above methods cannot be applied directly to indirect or semi-indirect fixtures. Polar curves are generally not furnished for totally indirect fixtures, and even if they were furnished, it would only be possible to use them for the purpose of predetermining the illumination on the ceiling, which in most cases is of very little interest, and it would not be possible to use them for the purpose of predetermining the illumination on a working plane, such as desk plane or lathe plane. For semi-indirect fixtures two polar curves would have to be given, and it would be very difficult even to predetermine the illumination on the ceiling. The fixtures being inverted, the real polar curve which can be obtained by laboratory measurement would naturally also be inverted and would be of no practical use. For this type of illumination it is necessary to obtain by direct measurement the foot-candle curve, similar to curves *"B"* and *"C"* in Fig. 5. Fortunately this has been made possible by the foot-candle meter. It is only necessary to install a single fixture and measure the foot-candles directly at different horizontal distances from the focus but keeping the foot-candle meter at all times on the same horizontal plane.

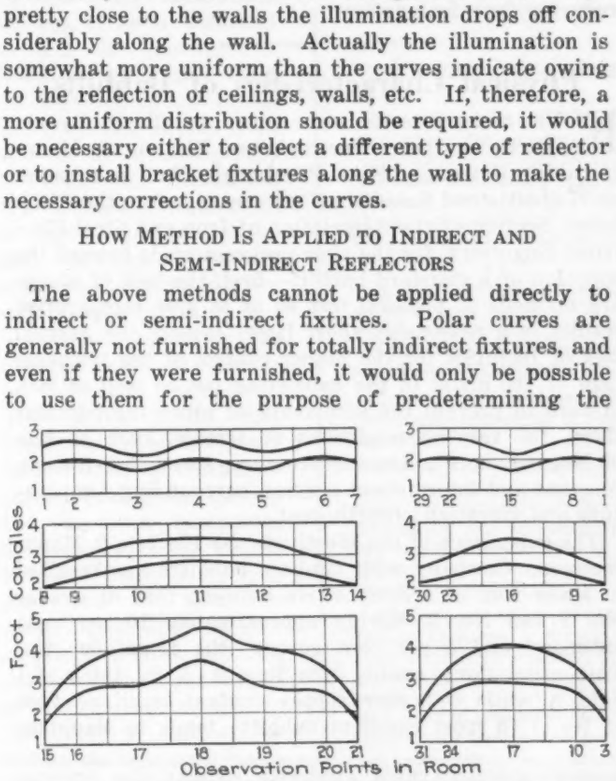


FIG. 7—DISTRIBUTION CURVES DEVELOPED FROM TABLE II

Upper curve of each pair is for plane 12 ft. below lamp, while lower curve is for 14 ft.

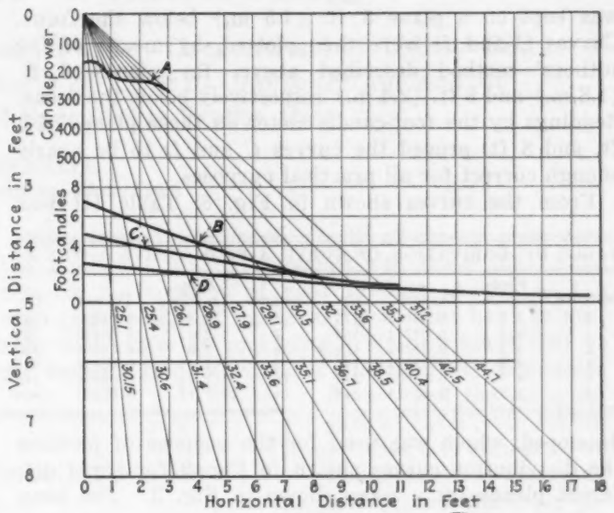


FIG. 8—FOOT-CANDLE CURVES FOR SEMI-INDIRECT FIXTURE

Curve *B* was determined by foot-candle meter readings and curves *A*, *C* and *D* by the authors' method. Curve *A* is referred to as "fictitious polar curve," curves *B*, *C* and *D* are for focal distances of 5, 6 and 7 ft. respectively.

But whereas the polar curve for a direct fixture is universal and is independent of the manner in which the fixture is suspended or of the characteristics of the ceiling, the directly determined foot-candle curve for indirect or semi-direct fixtures is applicable only to the particular conditions under which the values were measured which were used to make up the curve.

But for the same ceiling conditions and the same suspension of the fixture the method suggested by the authors and described above can be employed to advantage. If a curve has been determined experimentally for a certain plane of illumination, it is not necessary to make any further tests in order to obtain foot-candle curves for any other planes. The curves for the other planes can be derived from the foot-candle curve determined by experiment by means of the semi-graphic or totally graphic methods described above. Thus curve *B* in Fig 8 was determined by direct reading with the foot-candle meter, for an I. P. Frink fixture No. 551, which is of the semi-indirect type. The focus of the fixture was approximately 24 in. (61 cm.) from the ceiling, and the foot-candle meter

TABLE II—FOOT-CANDLE DATA FOR ROOM SHOWN IN FIG. 3, USING FIXTURE DISTRIBUTION CURVE SHOWN IN FIG. 4

D—Horizontal distance (approximate) of respective points 1, 2, 3, etc., from fixture *A*, *B*, *C*, etc. F_1—Foot-candles at respective points 1, 2, 3, etc., from respective fixtures *A*, *B*, *C*, etc., using curve *B* in Fig. 4. F_2—Same using curve *C* in Fig. 4.

At Points	1			2			3			4			8			9			10			11			15			16		
From Fixtures	D	F_1	F_2	D	F_1	F_2	D	F_1	F_2	D	F_1	F_2	D	F_1	F_2	D	F_1	F_2	D	F_1	F_2	D	F_1	F_2	D	F_1	F_2	D	F_1	F_2
A	3.5	1.3	0.94	2.5	1.38	1.0	5.6	1.06	0.78	10.5	0.64	0.53	2.5	1.38	1.0	..	1.54	1.13	5	1.12	0.82	10	0.66	0.56	5.6	1.06	0.78	5	1.12	0.82
B	12.6	0.6	0.5	10.5	0.63	0.53	5.6	1.06	0.78	2.5	1.38	1.0	12.5	0.6	0.5	10	0.66	0.56	5	1.12	0.82	..	1.54	1.13	13.5	.....	.....	11	0.6	0.5
C	23	.....	.....	20	.....	.....	15.0	.....	.....	10.5	0.64	0.53	23	.....	.....	20	.....	.....	15	.....	.....	10	0.66	0.56	23	.....	.....	20.6	.....	.....
D	12.6	0.6	0.5	12.6	0.6	0.5	13.5	.....	.....	16	.....	.....	10.5	0.63	0.53	10	0.66	0.56	11	0.6	0.5	14	.....	.....	5.6	1.06	0.78	5	1.12	0.82
E	17.7	.....	.....	0.16	.....	.....	13.5	.....	.....	12.5	.....	.....	16.0	.....	.....	14	.....	.....	11	0.6	0.5	10	0.66	0.56	13.5	.....	.....	11	0.6	0.5
F	26	.....	.....	0.24	.....	.....	20.0	.....	.....	16.0	.....	.....	24.5	.....	.....	25	.....	.....	18	.....	.....	14	.....	.....	23.9	.....	.....	20.6	.....	.....
Total, etc.	....	2.5	1.94	....	2.61	2.03	....	2.12	1.56	....	2.66	2.06	....	2.61	2.03	....	2.86	2.25	....	3.44	2.64	....	3.52	2 81	....	2.12	1.56	....	3.44	2.64

was kept on a plane 5 ft. (1.5 m.) below the focus. Curves *C* and *D* were then plotted, by means of the authors' method described above, for planes 6 ft. (1.8 m.) and 8 ft. (2.4 m.) respectively below the focus. Readings by the foot-candle meter on these planes of 6 ft. and 8 ft. proved the curves *C* and *D* to be nearly enough correct for all practical purposes.

From the curves shown in Fig. 8, Table III was

TABLE III—DERIVATION OF CURVE *A* FROM CURVE *B* (FIG. 8.)

Distance	Foot-candle	Divisor	Cp.	Distance	Foot-candle	Divisor	Cp.
0	7.0	0.04	175	6	2.85	0.0105	271
1	6.2	0.03771	164	7	2.25	0.00785	287
2	5.5	0.03202	171.5	8	1.8	0.00595	303
3	4.8	0.02522	191	9	1.45	0.00458	316
4	4.15	0.01904	218	10	1.25	0.00358	349
5	3.5	0.01414	248	11	1.15	0 00283	406

developed, which was used for the purpose of plotting the distribution curves shown in Fig. 9 for three different planes for a room shown in Fig. 3. The lamp used was a 200-watt gas-filled tungsten.

It is furthermore possible to develop a curve *A* in Fig. 8 by reversing the method used in connection with Figs. 1 and 4, in which case curves *B* and *C* were

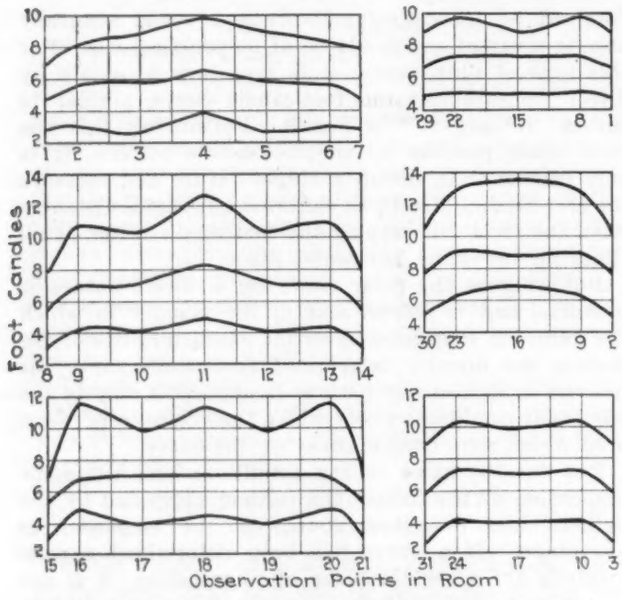


FIG. 9—DISTRIBUTION CURVES FOR ROOM SHOWN IN FIG. 3 EQUIPPED WITH INDIRECT FIXTURES

In each case the upper curve is for a plane 5 ft. below the focus, the next 6 ft. and the lowest 7 ft.

derived from curve *A*. Curve *A* in Fig. 8 can thus similarly be derived from curve *B*. But whereas curve *A* in Fig. 4 is determined in the laboratory by direct photometric measurements, curve *A* in Fig. 8 cannot be so determined. It is a "fictitious" curve and may be termed the "fictitious polar curve" of an indirect or semi-indirect fixture. Once this curve is obtained by the method suggested by the authors, foot-candle curves could easily be derived from it. It could also be used for the purpose of predetermining illumination on vertical planes. Whereas for direct reflectors the actual polar curve represents an integration over the whole area of the reflector, the fictitious polar curve of a totally indirect reflector would represent an integration over the whole ceiling area and the fictitious polar curve for semi-indirect fixtures would represent an integration over the whole ceiling area plus an integration of the direct illumination.

In spite of the fact that indirect illumination has been in general use for some time, it must be admitted that there are very few fixtures on the market for this purpose to satisfy the requirements of the conscientious illuminating engineer. Manufacturers should, therefore, be urged to study the problem more thoroughly than they have hitherto done, and they should be required to furnish with all their indirect or semi-indirect fixtures the respective fictitious polar curves for certain practical ceiling conditions and to develop by research practical factors to apply to different ceiling conditions. When this shall have been done a great deal of time and money will be saved on lighting installations, and the greatly increased uniformity in the distribution of illumination will aid materially in reducing "eye fatigue."

Physical Characteristics of Babbitts

FOUR main reasons were given by T. D. Lynch, research engineer Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., in a paper on "Babbitts and Babbitting" presented before the Pittsburgh Section of the Association of Iron and Steel Electrical Engineers, for the slow progress made toward the adoption of a standard babbitt—first, the lack of standard methods of physical test so as to give comparative results in a reasonably short time; second, the general lack of facilities for the proper control of the temperature of the metal in the babbitting pot as well as lack of care to prevent the admixture of other ingredients; third, the varying conditions of service, such as size of bearing, bore allowance pressure, speed, lubrication, constant and intermittent service, surrounding temperature and vibration; fourth, cost.

The experience of the Westinghouse Electric & Manufacturing Company with tin-base babbitts has resulted in a selection of a composition between that of grades No. 2 and No. 3, having approximately 10 per cent antimony and 5 per cent copper—the remainder tin. This metal flows readily into linings $\frac{1}{16}$ in. thick and lighter, while a higher copper content, such as that of No. 3 (a most excellent babbitt) tends to sluggish-

BABBITT SPECIFICATIONS, AMERICAN SOCIETY FOR TESTING MATERIALS

Alloy, Grade No.	Tin, per Cent	Antimony, per Cent	Lead, per Cent	Copper, per Cent	Iron, per Cent, Maximum	Arsenic, per Cent, Maximum	Zinc, per Cent	Aluminum, per Cent
1	91	4½	0.35a	4½	0.08	0.10	None	None
2	89	7½	0.35a	3½	0.08	0.10	None	None
3	83½	8½	0.35a	8½	0.08	0.10	None	None
4	75	12	10	3	0.08	0.15	None	None
5	65	15	18	2	0.08	0.15	None	None
6	20	15	63½	1½	0.08	0.15	None	None
7	10	15	75	0.50a	....	0.20	None	None
8	5	15	80	0.50a	....	0.20	None	None
9	5	10	85	0.50a	....	0.20	None	None
10	2	15	83	0.50a	....	0.20	None	None
11	..	15	85	0.50a	....	0.25	None	None
12	..	10	90	0.50a	....	0.25	None	None

ness when being poured, resulting in the necessity for much thicker linings than $\frac{1}{16}$ in. Likewise experience with lead-base babbitts has resulted in a selection of a composition between Nos. 7 and 8, having approximately 14 per cent antimony and 8 per cent tin, with not over 0.5 per cent copper and the remainder lead, resulting in a metal that flows even more readily than the tin-base composition and wears well.

Central-Station Financing*

Viewpoint of Investment Banker—Small Investors Now Buy Greater Part of Utility Bonds—Limitations to Suit Purchaser—Proper Ratio of Debt to Capitalization and of Earnings to Interest—Day of Speculative Profits Past

By H. M. ADDINSELL
Harris, Forbes & Company, New York

IT IS obvious that there is no financial or other institution so replete with funds that out of its own resources it can supply the large amount of money constantly required for your great and growing industry. Even if there were, prudence would prevent such an institution putting all its eggs in one basket. The investment banker, if he is wise and expects to continue in business, buys only what he can resell to his clients, the investing public. Just who is the investing public? In this connection the following statement of Carl D. Jackson, chairman of the Wisconsin Railroad Commission, will be of interest:

"The actual ownership of most public utilities is by the people themselves. The first liens on most public utilities are very often owned by trust companies, banks, and largely by insurance companies throughout the United States. Nearly every man carries an insurance policy. The average citizen has a bank account, yet not one citizen out of a hundred realizes that in one form or another his actual savings and insurance and his wife's and children's welfare depend upon the solvency and continued operation of public utilities. There is probably not one in fifty whom we meet on the street who does not own a part of a public utility, whether he knows it or not."

The investing public of today, so far as the bonds or notes of electric service companies are concerned, is different from that of past years. Banks and institutions are generally out of the market for this class of security; large private investors cannot afford to buy them for income-tax reasons, with the result that the large majority of our present sales of public utility bonds are to small investors—the man in the street—with one thousand, two thousand or possibly five thousand dollars to invest. Not only on account of the direct or indirect financial relation are your problems those of the man in the street, but also because of the economic importance of your industry, as the growth and prosperity of the communities you serve are directly affected by the character and extent of the facilities with which you are able to provide them.

Your industry, in common with all others, must face the high cost of the materials and labor that make possible the creation of your product as well as the high rental value of the money you must have to procure such materials and labor. We also know that at the moment the securities of public utility companies do not find the same degree of favor with investors that they once enjoyed. Confidence is returning slowly, and the wary investor must be wooed with an attractive bait if he can be interested at all in public utility bonds. What must this bait be? Prime security, high interest rate and, with the exception of the very choicest issues, a conversion or some similar feature to add also a speculative possibility to the investment.

Theoretically there are three means available to an electric light and power company by which it may obtain additional funds for the additional capital expenditures that are constantly and continuously required—(1) by sales of additional stock; (2) by borrowings, secured by mortgage or note, and (3) by use of surplus earnings. As a matter of practice, however, only the first two methods are available, as even if surplus earnings are temporarily used for new construction, these items go into capital account and are eventually represented by capitalization in the form of either stock or indebtedness. Generally speaking, the means that permit a company in good times and bad to raise the major part of its funds at the most advantageous rate are the sale of its funded obligations, bonds or notes.

From Mr. Addinsell's Paper

The investor does not want a bond issued under a mortgage where the present character of the property or security may be changed by the escrow conditions; hence the limitation eliminating securities as the basis for the issue of future bonds, the limitation regarding the character of physical property that may be made the basis of a future bond issue, and the "disconnected property" and franchise restrictions.

It would perhaps be reasonably conservative to say that no more than three-fourths of the capitalization should be represented by mortgage debt and one-fourth by stock, and a two-thirds and one-third ratio would be even more sound and conservative.

To retain a first-class status in the minds of bond purchasers, a company must show at least a two-for-one earning ratio.

The day of possible large speculative profits in public utility securities is past. With the regulation that exists and the incontrovertible fact that these industries are an indispensable and permanent part of the economic structure of the communities they serve, they are partaking, and I think will partake increasingly, of the nature of quasi-municipal securities.

The solution of all the problems of the electric light and power companies is very simple to express but probably very difficult to achieve. It is simply to arrive at a complete and mutual understanding of one another's problems, which when arrived at will make possible, if approached in a spirit of sympathy and fair play, the equitable adjustment of our relations to one another.

More Flexibility in Present-Day Mortgages

Past mistakes in creating small authorized mortgage issues have been recognized and cured by providing for very large or unlimited authorized issues. A recognition of the lack of flexibility in old mortgages to meet changing market conditions and permit the companies to avail themselves of their prime security under varying market conditions has led to the provision in modern mortgages which permits the issue of bonds thereunder in so-called series, with the right to make the maturity and the face interest rate appropriate to the then existing market conditions. This provision generally includes also the right to refund existing series by the

*Part of a paper read before the Association of Edison Illuminating Companies at New London, Conn., Sept. 13-16, 1920.

issue of a new series. Such mortgages should, however, contain some restriction on the creation of shorter series than any existing series, on the theory that while the creation of a shorter series does not prejudice the intrinsic position of an already outstanding longer one, investors look with disfavor on the possibility of a series of bonds being issued later with a preferential position as far as payment of principal is concerned.

The investor does not want a bond issued under a mortgage where the present character of the property or security may be changed by the escrow conditions; hence the limitation eliminating securities as the basis for the issue of future bonds, the limitation regarding the character of physical property that may be made the basis of a future bond issue, and the "disconnected property" and franchise restrictions. He is also concerned as to his relative lien on the property, the continuation of that relative lien and, in fact, the improvement of it. Out of that has grown the limitation on the acquisition of additional properties carrying prior liens.

We must bear in mind that in these big "series" mortgages we are projecting ourselves far into the future. Of course, we cannot guarantee future management, but we attempt to outline a basis in these mortgages that will confine a possibly unwise management within limitations with respect to the issue of bonds that will preserve the security and integrity of the original situation and which, on the other hand, will not hamper a sound management in availing itself of its prime security to a proper extent in the legitimate future development of the property.

THE OLD SINKING FUND AND THE NEW

In industrial financing it is customary to require amortization of at least a substantial portion of a loan from earnings during the life of the obligation. In old electric light and power mortgages we find sinking funds requiring the paying off of a certain amount of the bonds each year from earnings to accomplish this. But the particular position of public utilities does not justify an insistence upon the retention of this feature in modern mortgages. The investor in your securities must recognize frankly that your business is a permanent and continuing one that forms an important economic part of the life and business of the communities served; in fact, you could not stop doing business if you would. Even if you did, others would take the property on which the bondholder has a mortgage and carry on the business. And your earnings come under public franchises, so you cannot charge rates that would permit you to amortize your borrowings out of earnings. Neither the public nor the public service commissions would permit it. Therefore the straight sinking fund is disappearing and in its place comes the sinking or improvement fund.

The theory of the old sinking fund was, of course, to reduce the debt and thus improve the relation between property and bonds and incidentally create a market from time to time for the bonds. The theory of the sinking or improvement fund is to improve the relation between property and bonds by permitting the company either to expend the funds arising therefrom for additions and extensions to the property, which might otherwise have been made the basis for the issue of bonds, or to retire bonds therewith. This has accomplished the result, although perhaps not quite so definitely and satisfactorily from the standpoint of the bondholder, for it does not give him a definite recurring market nor does it have the same stimulating effect on the market for the bonds.

As I say, the action of the sinking or improvement fund is not so positive and so concrete as that of the sinking fund, and modern thought in investment banking circles is turning toward a requirement for a definite percentage of gross earnings to be expended or appropriated each year for maintenance and depreciation, relying on the action of such a fund to preserve the integrity of the existing property and on the operation of the escrow clauses permitting the issuance of bonds for 75 per cent or 80 per cent of expenditures to improve the relation between property and bonds.

It may be argued that a percentage of gross earnings is not necessarily a scientific or accurate way to arrive at the proper amount that should be expended or appropriated each year for maintenance and depreciation, and that the true basis for such a covenant would be the value of the physical property, taking into consideration the rate of depreciation of the various classes of property involved. This may be correct theoretically, but practically, as far as I know, no one has been able to think out a workable method for applying the principle in a mortgage; that is, a method workable and satisfactory from the standpoint both of the company and of the bondholder. Furthermore, as a practical matter, we all know that the ratio of gross earnings to physical property is apt to remain approximately the same in the average electric light and power company, and in a number of cases that we have figured out the percentage of gross agreed upon for maintenance and depreciation runs surprisingly close to the amounts that would have been required had they been figured on the basis of the actual maintenance and depreciation requirements of the physical property.

In the interest of the public, the stockholders and the bondholders, it is imperative that the property of the companies be at all times kept in good physical condition and capable in every way to give the best of service at minimum cost. Inasmuch as the bondholders are asked to furnish the bulk of the money to create these properties and at the same time are limited to a definitely fixed return materially less than is allowed upon the investment as a whole, it is absolutely necessary that all mortgages should contain adequate and enforceable provisions to insure the making of such repairs, renewals and replacements as may be necessary from time to time to preserve the integrity of their security and keep the property in a high state of operating efficiency.

It has become a matter of practice to permit electric light and power companies to issue additional bonds for 75 per cent or 80 per cent of the cash cost or fair value, whichever is less, for additions and improvements to their property. In the latter case this means that, looking toward the future, you are indorsing the proposition that it is good practice to capitalize these companies on the basis of four-fifths mortgage debt to one-fifth stock. Looking at it from this aspect, I am sure we shall all agree that this is not fundamentally sound and is verging toward the situation of too large a percentage of capitalization being represented by bonds or borrowed money—the same unbalanced condition that caused the past difficulties of many of our steam railroads and also of some of our public utilities.

It would perhaps be reasonably conservative to say that no more than three-fourths of the capitalization should be represented by mortgage debt and one-fourth by stock, and a two-thirds and one-third ratio would be even more sound and conservative. I know that your answer to this proposition will be to point out the difficulties of raising junior money for these properties, especially with the kind of rate regulation that we have had in the past, but here again we should all work for the establishment of the electric light and power industry in the minds of the public and the commissions in such a way that the investor in the equities will feel sure of a reasonable fixed return even if the speculative possibilities are largely eliminated by such regulation.

It has also been customary in the past in the best bond issues to have a requirement that net earnings must be equal to twice the interest on all bonds outstanding, together with those proposed to be issued, as an additional restriction precedent to the issuance of escrow bonds. With the high face interest rates that it is now necessary to pay in order to attract investors, combined with the limitation on earnings imposed by rate-regulating authorities, it has sometimes been recognized that under the special conditions existing at present it is not practicable to insist on the two-for-one ratio, and many new mortgages are being drawn with only a one and three-quarters earnings requirement. Perhaps I should point out that, notwithstanding the reasonableness of a demand on the part of the company for a departure from a two-for-one ratio in view of present high interest rates, it is extremely difficult to market bonds where the showing of earnings is less than two for one, and I should feel that I was remiss in endeavoring to place before you the bondholder's viewpoint if I did not call attention to the fact that to retain a first-class status in the minds of bond purchasers a company must show at least a two-for-one earnings ratio.

I have spoken of the practical difficulties that are encountered at present in marketing equity securities. The single exception thereto, and it is a very important one, appears to be the sale of preferred stocks to employees and customers. The advantages of such sales, aside from the additional source of capital it creates, from the standpoint of both the company and the customer, and the relations of the company to the community in general, are so obvious and so well understood by us all that they do not need further comment. This proceeding, furthermore, is a long stride in the direction of the establishment of a more complete understanding between your companies and the public. I should like also to mention that it would appear to be good business to go one step further and market locally at least a certain proportion of the *common* stock of these companies. Modern thought is that the public interest can be best served by having all corporate stocks without par value. This should greatly benefit public utilities, which, unlike industrial companies, cannot stand still but must be able to sell their stocks under varying market conditions in order to provide for constantly increasing public needs for service.

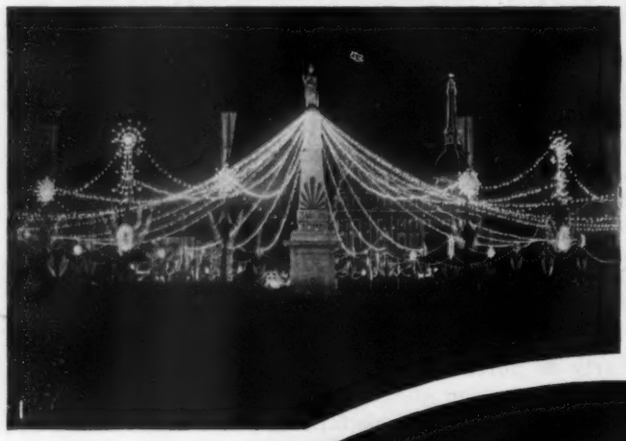
A problem that modern conditions in your industry is making increasingly more important is the question of financing the great generating stations operated by water power or located at the mouth of coal mines which can turn out a large quantity of energy at low unit costs and provide the needs, at least in part, of one or more companies. These cannot very satisfactorily be financed as construction propositions standing on their own feet. They can best be financed through the construction stage by using the credit of the distributing company or companies that they are designed to supply. It sometimes happens, so large are these generating stations and so great the amount of money required, that a particular company with enormous demands for power finds itself in a position where its earnings will not support a sufficient amount of its own securities to enable it to avail itself of its own sources of financing. A suggestion that has been made in this connection is that in such an event a separate company should be formed with the new generating station as its principal property, the voting stock of which should be owned by the distributing company or companies and the generating station leased in perpetuity to the distributing company on suitable terms, with the option on the part of the distributing property to purchase the power plant at its cost to date. The generating company can then issue its own first mortgage for a suitable term of years with suitable call privileges, which in turn should be guaranteed by the distributing company. Provided the details are satisfactorily worked out, such an arrangement should result in a safe and salable security, although the distributing company would still be faced with the problems of raising the equity money and having in hand at the time of the sale of the generating company securities sufficient funds to insure the completion of the plant.

THE FINAL SOLUTION OF ALL PROBLEMS

My theory is that the solution of all the problems of the electric light and power companies is the same broad solution that is the answer to the economic and industrial problems at present pressing the entire world for answer, and of which the labor problem is an important and conspicuous example. That solution is very simple to express but probably very difficult to achieve. It is simply to arrive at a complete and mutual understanding of one another's problems, which when arrived at will make possible, if approached in a spirit of sympathy and fair play, the equitable adjustment of our relations to one another.

I am not here to discuss the complicated question of what is a fair rate of return, with all its technical and practical complications in the way of valuation, necessary but unproductive investment—hard-earned dollars that have been invested in public utility enterprises and been unproductive for sometimes long periods of time—and what is a fair rate of return under changing conditions, but I will say that we may all just as well face frankly the fact that the day of possible large speculative profits in public utility securities is past. With the regulation that exists and the incontrovertible fact that these industries are an indispensable and permanent part of the economic structure of the communities they serve, they are partaking, and I think will partake increasingly, of the nature of quasi-municipal securities. I look forward to the day when public utility practice and financing will be so standardized and stabilized that the securities of these companies, at first in the larger communities and eventually everywhere, will command a market closely approximating—both as to level and ready marketability—that enjoyed by the obligations of the municipalities themselves.

Special Lighting During National Holiday at Buenos Aires Despite High Fuel Cost



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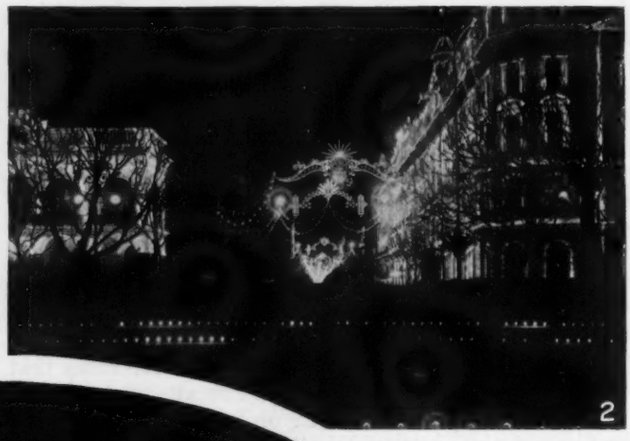

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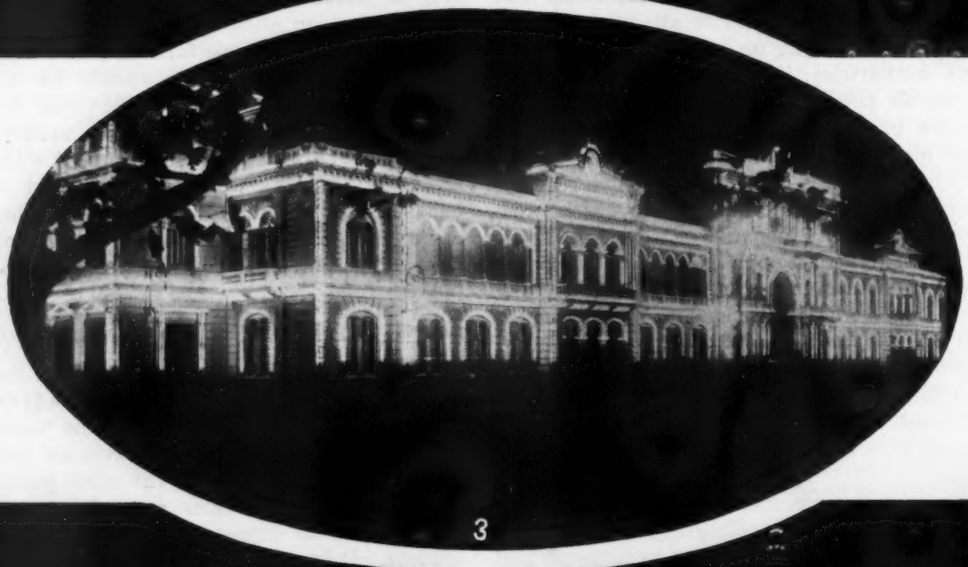

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In spite of the difficulties in obtaining coal during the past year, when the price of both coal and wood have been high, Buenos Aires was remarkably successful in carrying out plans for decorative illumination for the national holiday of May 25. The accompanying illustrations Nos. 1, 2 and 4 show various scenes in the Avenue and Plaza de Mayo. No. 3 is the Casa Rosada, corresponding to our "White House," and No. 5 shows the national Congressional building. The special lamps and fixtures were provided by the city, and the electrical utilities of Buenos Aires furnished the energy for their operation.

It is interesting to note that the price of red quebracho, a very hard wood, burned in chunks, with nearly half the fuel value of coal, on April 15, 1920, was $11 per long ton. while coal, during the past year, has ranged from $25 to $30 per long ton. During the war coal reached the nominal price of $70 per ton, but there was none available. It was then, some two years ago, that the practice of burning wheat, corn, bran and sawdust was started.

A representative of the McGraw-Hill Company who fortunately was able to be in the city at that time was astonished to note not only the profusion and magnificence of the lighting throughout the city but also the spirit of enthusiasm of the people who filled the streets and parks.

Electrical Possibilities in South America

Great Opportunities for Water-Power Development—Enormous Cost of Coal—Operating Difficulties and How They Are Overcome

BY VERNE LEROY HAVENS*

SOUTH AMERICA has benefited financially from the turmoil of the past five years. Farm and mine products have been sold at very high prices, and although this has been partly offset by the high costs of imported articles, South Americans have been forced to economize materials and equipment of all sorts for the simple reason that materials were needed by all the industrial nations for their own use. Some countries were so isolated that they could not ship, if they would, and in few cases were ships available for carrying anything not absolutely essential. Hence South American nations have purchased comparatively little and must buy much if only to take care of deferred maintenance. This applies to most things, and very especially to electrical equipment and supplies, railway equipment of all sorts and building material. They must buy for deferred maintenance, but at the same time South America has not fallen behind in its desire for further intensive development, and the work of the past five years and that of the next five years must be done together in the five years to come.

With the exception of southern Chile and certain comparatively isolated sections of Colombia, Venezuela and Peru, South America has no bituminous coal. The anthracite in Peru is about the only deposit known on the continent, and the lignite of southern Brazil, high in ash and sulphur, is virtually the only known coal on the east coast. Normally the railways import coal for locomotives in practically every port. Millions of tons have been required for this purpose.

Today the French mines are out of commission to a large extent. Germany cannot ship for one reason, Great Britain for another, and the United States for still another, in any appreciable quantities. As a matter of fact, the United States, England and Wales, and Australia are called upon to supply a large part of the world with coal, and they cannot do it under existing circumstances. Coal at Rio Janeiro, for example, has not been below $20 a ton since the early days of the war. Suffice it to say that generally the cost has been more at other ports, and although the actual conditions will no doubt improve, it is interesting to know that within recent weeks coal has been delivered at Rio at $35 per ton.

From the Uruguay River, perhaps 300 miles from Buenos Aires, northwest across the Continent, there are enormous possibilities of hydro-electric development. In Brazil there is power in quantities on every river, and there are many rivers.

The one state of São Paulo, Brazil, has an export trade as great as that of the Republic of Mexico, a comparatively large literate population, railways radiating in every direction, burning coal at $25 to $40 a ton or scratching around for wood to burn, and the power possibilities in every neighborhood are simply stupendous. The state is gently mountainous, if one may use such a term, and has an annual rainfall of about 54 in. (137 cm.).

The Paulista Railway has contracted with the General Electric Company to electrify its line, and but a month or so ago there was introduced in the National Congress a bill to authorize the electrification of the Brazil Central Railway from Rio Janeiro to Barra de Pirahy, the mountain section of the line connecting the national capital with the city of São Paulo. The Paulista project will cost about $10,000,000 and the Rio Janeiro-Barra de Pirahy project about $11,000,000, the saving of coal by the latter being calculated to be about $2,500,000 per annum.

There are at least fifteen aluminum transmission lines in the state of São Paulo, and they have large deposits of bauxite ore, which means not a little in their future development.

Brazil has in the water-power region excellent clay for refractories, the largest single deposit of iron in the world—and at the same time perhaps the purest—great deposits of 48 per cent manganese near by, and

MINING WITH POWERFUL ELECTRIC SHOVELS WHICH ARE SAID TO FAR EXCEL THEIR STEAM BROTHERS

a rapidly increasing demand for steel rails for its railways. Manganese-steel rails will no doubt ultimately be used, of a lighter section than those of commercial steel, because of high manganese content. There being no frost, this is possible. This is only one angle of electrical possibilities in this region, as considered in connection with furnace development.

In practically every city on the continent the available power is oversold, and extensions will be unavoidable in the near future. Uruguay is becoming especially interested in the development of the Salto del Uruguay, and Buenos Aires is even casting longing eyes on the water power at Iguassu, 500 miles away, for use to supplant coal for light and power in that city of 1,800,000 people, as well as for its suburban railways.

Chile, Peru and Ecuador are all interesting themselves in railway electrification. One has no conception of what lack of fuel means to a country or how a coal shortage will worry an engineer unless he has been "up against" those conditions.

Buenos Aires has some coal today but still burns a great quantity of wood. During the war the coal theoretically reached $70 a ton—only there was none to

*Editor of *Ingeniería Internacional*, the international engineering journal printed in Spanish by the McGraw-Hill Company. Mr. Havens has just returned from a three months' visit in various parts of South America, where he discussed conditions with men closely allied with achievement there. Prior to his association with the McGraw-Hill Company he was engaged in Latin-American countries and Spain for more than fifteen years.

be had. The city was lighted with wood and wheat and corn and bran. A small 50-kw. plant in central Argentina, owned by a company having similar interests in Cordoba, Junin and elsewhere, was actually producing light and power by burning bran and hay. There is no prospect of coal very soon at any reasonable price, and people are afraid to trust to imported fuel. Longer transmission distances are noted often nowadays, and there is no reason apparent why the electrification of every important railway in South America not in a great desert or prairie district should not take place within a comparatively short time.

Among the minor electrical problems noted in various places, notably on the west coast in Peru and Chile, but also on the east coast, is that of insulators installed near the sea. The sea mist, bearing salt and various other ingredients, drifts in and dampens the insulators. Then light breezes blow and mix fine dust with the salt film, and the final result is an arc across the insulators. In certain localities, notably Lima, the insulators must be designed for a voltage notably higher than that which the line actually carries.

Another interesting fact was noted in Rio Janeiro. Experience there has been that the crowding together of many cable conduits has interfered with ventilation and the cables have become overheated. The vaults were tightly closed and the imprisoned air became intensely hot. With the burning of a cable the manhole cover would be lifted and the whole vault apparently burst into flames. The old practice, first developed by telephone companies and followed by those installing low-voltage cables, of putting all the conduits in one trench has been abandoned, and the lines are now separated. It is said that now almost no difficulties arise. It is a matter of record that the Rio Janeiro Tramway, Light & Power Company has virtually no electrical troubles, and what would normally be considered a simple delay in New York would be a scandal in Rio. The electrical department is supervised by E. A. Sturgis.

Another interesting experience was met in viewing the remains of the Valparaiso tramways on March 11. They were owned by German interests which had not made any repairs since 1914, and the service did not impress any one very favorably. Owing to a minor quarrel, the bottled annoyance of several years broke out, and the mob certainly spilled vials of wrath on the tramcars. Rioters tramped from one street to another all over town, and wherever a car was found it was torn apart and burned.

Now the citizens have no trolley cars, but they ride on drays and carts, or they walk, and apparently they are happy over it. The unfortunate outcome was the result of years of quarreling, and it is doubtful whether new interests could be induced to re-establish the service at the old fares of 1 cent and 2 cents for second and first class.

Unusual Efficiencies with Oil Fuel

Using Fuel Oil with Mechanical Atomizers, the Savannah Electric Company Has Obtained Boiler Efficiencies of 80 per Cent with 300 per Cent Boiler Rating—Normal Operation of 250 per Cent Rating

By JOSEPH POPE and FRANK G. PHILO,
Division of Construction and Engineering, Stone & Webster, Inc.

DURING the latter part of 1919 the Savannah (Ga.) Electric Company and the Blackstone Valley Gas & Electric Company of Pawtucket, R. I., which had previously burned coal exclusively in their power plants, entered into contracts for fuel oil. Under the Blackstone Valley oil contract deliveries were not scheduled to begin until the summer of 1920, so the reconstruction of the Pawtucket plant of that company, which is to be converted to oil burning, is still under way. The Savannah installation was completed early in the present year.

The Savannah oil-burning installation at its Riverside plant has now been in operation seven months and the results throughout have been extremely gratifying. The furnace design has met all requirements, and tests, the results of which are given in the accompanying tabulation and also partly indicated in the curves, show that the high efficiency obtained at the boiler rating is maintained to a remarkable degree at extreme overloads.

Since the adoption of fuel oil the boilers have been operated normally at about 250 per cent of their rated capacity and there has been no instance of tube trouble throughout the seven months of operation, although the boiler-feed water is by no means entirely free from solid impurities. All indications are that general maintenance will be low. Operation has been found extremely simple. Only two conditions require adjustment at the furnace, oil pressure and draft, and it has been possible to schedule these conditions and their adjustments so accurately that the every-day operating performance closely approximates the best test results.

Existing Forms of Oil-Burning Equipment Were Inadequate for This Installation

Load conditions at the power stations of both the Savannah and Blackstone Valley companies required the development of high boiler outputs and made high efficiencies at these outputs extremely desirable. While the steam-atomizing type of burner, which had been used exclusively in all the larger oil-burning power plants of this country, gives excellent results at about the builder's rating of the boiler and a little above, the efficiency falls off rapidly at the higher overloads, and the extreme overloads demanded of the Savannah and Pawtucket boiler plants would have been impossible of attainment in the usual form of furnace.

The mechanical atomizing type of oil burner offered promising possibilities, but the type which had been in use for marine service had not shown as high efficiency commercially as the steam-atomizing burner. Furthermore, the boiler ratings obtainable per burner were considerably lower. Fortunately a new type which could be operated at high rating had been developed by

the Babcock & Wilcox Company about the time the conversion of the Savannah and Pawtucket plants to fuel oil was under consideration. The performance of this burner was investigated.

With the new type of burner a specially designed orifice disk or tip is employed, in which the oil is led to a central circular perforation through tangential grooves and thus attains a violent rotary motion as it is projected through the orifice. The resulting spray takes the form of a widely diverging cone of extremely fine mist. The burner proper is set in the furnace wall at the center of an air register so designed as to impart a whirling motion to the entering air. It was found that this construction gives extremely thorough atomization and an intimate admixture of air and oil which

pumped by a motor-driven Kinney pump to a similar service tank at the Indian Street station (another plant of the Savannah company), several hundred feet away and at a higher level. In the service tanks the oil is heated to about 100 deg. Fahr. It is then pumped to the burners through high-pressure heaters. At the Riverside station the oil reaches the burners at about 230 deg. Fahr. and at pressures varying up to about 210 lb. (14.7 kg), dependent upon the rating desired. The high-pressure oil pumps and heaters are housed in a separate fireproof room constructed within the station. Forced draft is supplied by turbine and motor-driven fans.

A single size of burner tip fulfills all requirements of normal operation. The proper relation between oil and

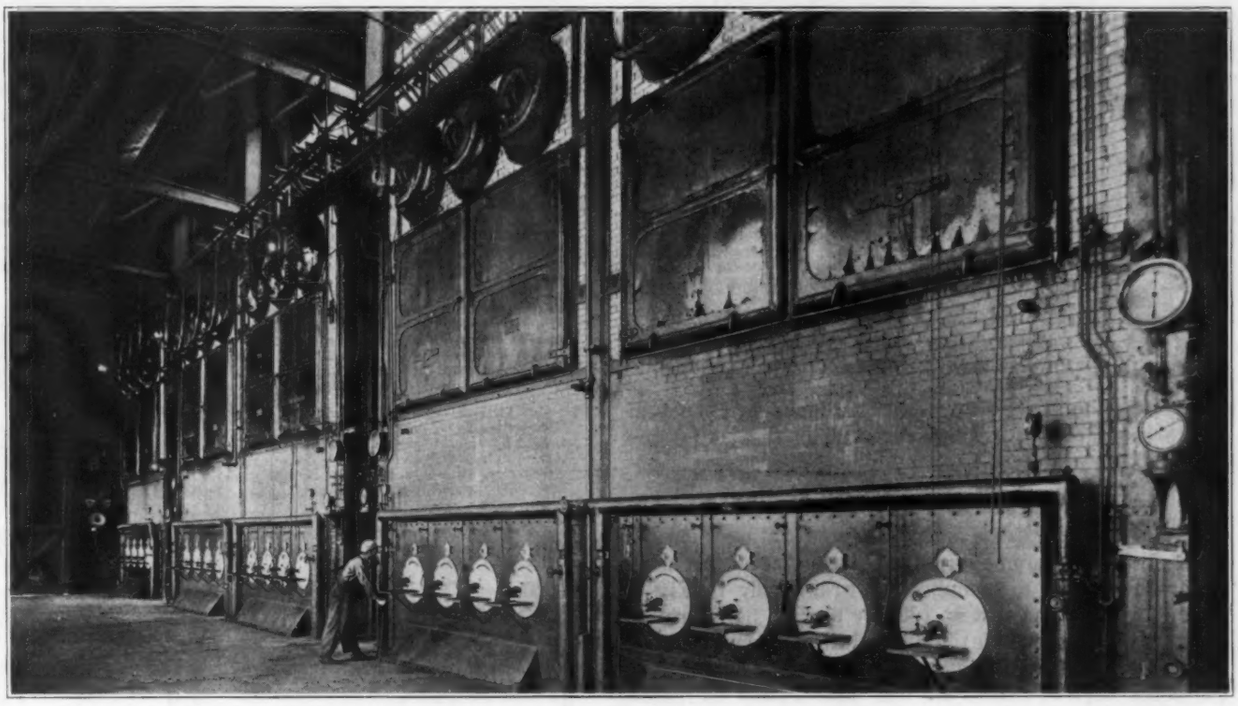


FIG. 1—HIGH EFFICIENCIES AT FORCED BOILER RATINGS HAVE BEEN OBTAINED IN THIS FUEL-OIL INSTALLATION AT THE RIVERSIDE STATION OF THE SAVANNAH ELECTRIC COMPANY

are particularly desirable. The flame starts close up to the burner tip and is practically noiseless. The rate of combustion is controlled by the temperature and pressure of the oil. The size of orifice in the burner tip also determines the rating, but burner tips can be obtained in various sizes and are interchangeable, the largest size having a normal capacity of about 1,400 lb. (635 kg.) oil per hour, at 200 lb. (14 kg.) pressure. Because of these advantages it was decided to equip the plants mentioned with these burners.

Since the Riverside boilers were originally equipped with stokers for bituminous coal the stokers were removed and four oil burners installed under each boiler. As shown, the lower part of the furnace front is covered by a steel-plate blast box, in which are set the registers and burners and through which the forced draft is supplied.

Fuel oil is received at the above-ground steel tank storage at Riverside by pipe line direct from the supply station of the oil company. From the Riverside storage oil may be fed by gravity to a two-compartment underground service tank for use at the Riverside station, or

air pressures throughout the capacity range was determined by analysis of the combustion gases and is maintained by varying the air and oil pressures in direct proportion. No adjustment of air registers is required so they are set wide open. No difficulty is experienced in maintaining smokeless conditions with varying load at all ratings.

TESTS OF THE NEW INSTALLATION

During May, 1920, a series of tests were conducted on one of the Riverside boilers for the purpose of formulating a proper operating schedule and incidentally to determine the actual efficiency of the installation. To insure constancy of radiation during the test, the boiler in battery with the test boiler was not kept under fire.

For this purpose a separate oil pump and heater were set up and all oil actually weighed as fed to the test boiler. Feed water was measured by two specially calibrated Venturi meters, which were installed in the front and rear feed connections respectively. Since only one feed was used at low ratings, good scale indications

were obtained on the manometers for all desired rates of boiler output. Centrifugal feed pumps were used and the flow was very steady. The tests were of four and five hours' duration, with three to four hours' preliminary operation under test conditions, insuring almost absolute constancy of results throughout the actual test period.

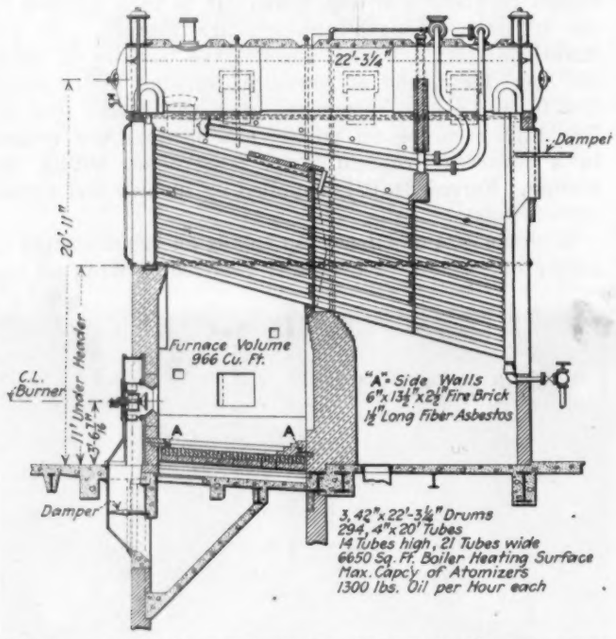


FIG. 2 — SECTIONAL ELEVATION OF 665-HP. BOILER IN WHICH THE COAL-BURNING FURNACE WAS CHANGED TO OIL-BURNING

RESULTS OF TESTS ON THE NEW EQUIPMENT

Results of the tests are presented in considerable detail in the accompanying tabulation, and the more important results are emphasized graphically in Fig. 3.

For example, the test at 168 per cent of boiler rating (not shown in the table) indicated an efficiency slightly below the corresponding value on the curve. For this test the percentage of excess air was deliberately increased, because, although no evidence of incomplete combustion had been detected in previous tests, it was feared that the air ratio might possibly have been held too low, permitting the escape of some slight trace of CO. From the test results, however, this had evidently not been the case. In the test following and the one used in plotting the curves the air excess was reduced to the same low figure previously allowed.

During the test at 114 per cent of boiler rating a negative value was obtained for the draft loss through the boiler. At this low rating the chimney effect of the furnace and first pass evidently created a greater pressure reduction at the point of furnace draft measurement than was required to carry the gases through the two remaining passes of the boiler. An interesting observation resulting from the increased furnace efficiency is the effect upon superheater performance. When burning coal the steam was superheated, on the average, about 140 deg. Fahr., and it was necessary to keep constant watch of the condition of boiler heating surfaces to avoid exceeding this figure. With complete combustion, as occurs with the oil-burning installation, and the resulting increased heat absorption by the first pass of the boiler proper, the superheat imparted by the same area of superheater surface is reduced approximately one-half.

The efficiency curve speaks for itself. The values given are gross efficiencies, but any deduction for heat supplied to oil pumps, heaters and forced-draft fans is negligible, as the exhaust steam is fully utilized for heating boiler-feed water.

So far as known there is no other boiler installation giving efficiencies approximating 80 per cent at 300 per cent of boiler ratings.

Stone & Webster, Inc., division of construction and engineering, handled the problem of design and reconstruction of these plants for oil burning.

RESULTS OF TWO OF A SERIES OF TESTS TO DETERMINE THE EFFICIENCY OF MECHANICAL ATOMIZATION OF FUEL OIL

Capacities:		
Rating developed, per cent	113.7	293.3
Hp. developed (B. & W. 665-hp. boilers)	756	1,949
Efficiency:		
Efficiency of boiler, furnace and burners, per cent	82.43	80.15
Evaporative Results:		
Water actually evaporated per lb. oil, lb	14.58	13.74
Equivalent evaporation per lb. oil, lb	15.70	15.22
Barometer, in Hg	29.84	30.02
Length of test, averaged, hours	4	4
Number of burners used	4	4
Grade of oil burners used (Gulf Refining Co.'s Mexican fuel oil; 16.6 deg. Baumé at 60 deg. F.; moisture, 0.8 per cent; flashpoint (closed cup), 181 deg. F.)		
Size of burner tip, drill size	47	28
Average Pressures and Temperatures:		
Steam pressure, lb. gage per sq.in.	190.0	201.0
Temperature of superheated steam, deg. Fahr.	427.0	483.0
Temperature of saturated steam, deg. Fahr.	384.0	388.3
Superheat, deg. Fahr.	43.0	94.7
Feed-water temperature at boiler, deg. Fahr.	213.5	213.0
Factor of evaporation	1.0766	1.1080
Temperature of exit gases, deg. Fahr.	438	566
Temperature of air to burners, deg. Fahr.	110	100
Oil pressure at atomisers, lb. per sq.in.	210	217
Oil temperature at atomisers, deg. Fahr.	238	230
Draft Observations:		
Air pressure at atomizers, in. water	0.37	2.96
Furnace draft, in. water	0.11	0.11
Draft at boiler side of damper, in. water	0.08	0.59
Draft loss through boiler, in. water	0.03	0.48
Draft loss through air registers, in. water	0.48	3.07
Draft loss through boiler and registers, in. water	0.45	3.55
Flue-Gas Analyses—Third Pass:		
Carbon dioxide by volume, per cent	14.30	14.40
Oxygen by volume, per cent	1.60	1.43
Carbon monoxide by volume, per cent	0.00	0.00
Nitrogen by difference, per cent	84.10	84.17
Excess air over theoretical, per cent	14.02	13.3
Weight of Water and Oil:		
Water fed to boiler per hour, actual, lb.	24,212	60,720
Water evaporated per hour, equivalent, lb.	26,077	67,278
Oil fired per hour, lb.	1,661	4,421

Heat Balance:	B.t.u.	Per Cent	B.t.u.	Per Cent
Heat absorbed by boiler	15,226	82.43	14,769	80.15
Loss by imperfect combustion	00	0.00	0.00	0.00
Loss in dry gases of combustion	1,180	6.39	1,665	9.04
Loss due to moisture from hydrogen	1,080	5.85	1,145	6.22
Loss due to moisture in oil	9	0.05	10	0.06
Loss due to moisture in air	21	0.11	32	0.17
Radiation and unaccounted for	955	5.17	806	4.37
Heating value per lb. oil	18,471	100.00	18,427	100.00

Ultimate Analysis of Oil, percentages: Carbon (C), 83.22; hydrogen (H), 10.16; oxygen, (O), 3.64; nitrogen (N), 0.10; sulphur (S), 2.83; sediment, 0.05.

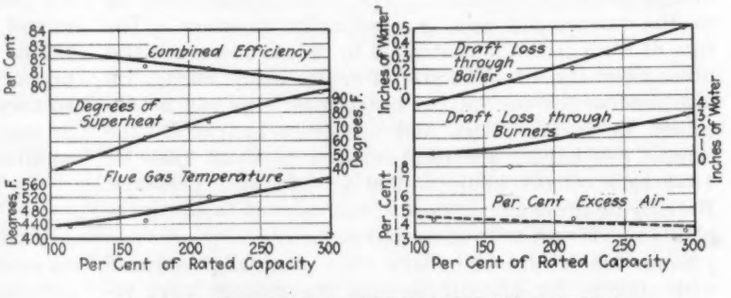


FIG. 3—SOME IMPORTANT RESULTS OBTAINED DURING OIL-BURNING TESTS ARE INDICATED

Generating Plant at the Mouth of Mine—II

Analysis Shows that House Turbine and Electric Drive for Auxiliaries Are Economical — Treatment of Boiler-Feed Water by Evaporator System a New Feature — Recirculation of Condenser Water Is Provided For

By G. G. BELL
Manager Power Generating Department West Penn Power Company, Pittsburgh, Pa.

HOW the West Penn Power Company leased a coal mine that will provide the Springdale station (ultimate rating 300,000 kw.) with fuel for fifty years was emphasized in the Sept. 25 issue of the ELECTRICAL WORLD, which also covered the selection of coal-handling and boiler-room equipment at this plant. In the current number important features of the turbine-room apparatus are analyzed, reserving electrical matters for a later date. A careful study of feed-water heating resulted in the selection of house turbine and electric drive for auxiliaries. The exhaust from this turbine should prove ample for feed-water heating. A low-pressure evaporator system which has been in use in sugar manufacture is here applied to the treatment of boiler make-up water, and experience thus far has been completely

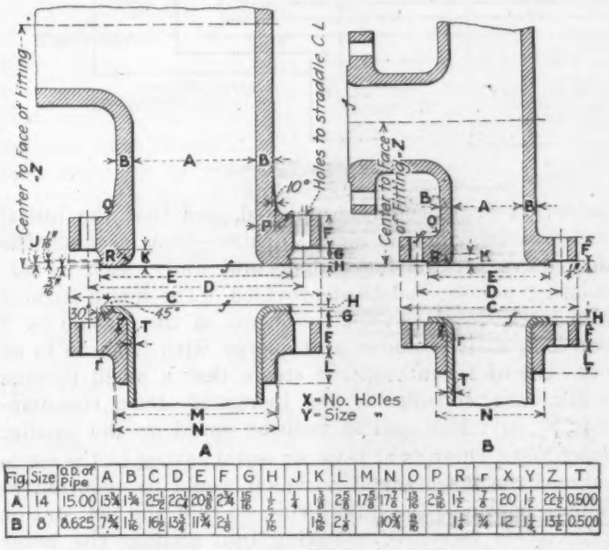


Fig.	Size	O.D. of Pipe	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	R	r	X	Y	Z	T
A	14	15.00	13¾	1¾	25½	22¼	20⅜	2¾	15/16	½	¼	1⅛	2⅝	17⅝	17⅝	13/16	2⅝	1½	⅞	20	1½	22½	0.500
B	8	8.625	7¾	1⅛	16½	13½	11¾	2⅛		7/16		1⅛	2⅛		10¾	⅜		1⅛	¾	12	1¼	13½	0.500

FIG. 8—DETAILS OF 400-LB. (28-KG.) STEAM AND WATER FLANGE AND FITTING

satisfactory. Arrangement has also been made for recirculation of condenser water in case of trouble at the intake from ice or trash.

Turbine Room.—The generating equipment consists of two 25,000-kva. Westinghouse generators, three-phase, 60-cycle, designed for a maximum of 12,000 volts, driven by Westinghouse double-flow turbines.

The condensing equipment was supplied by the Westinghouse company, and consists of a single 32,000-sq.ft. (2,930-sq.m.) condenser per unit, having 1-in. (2.5-cm.) tubes about 20 ft. (6 m.) long. The condensers are hung from the turbine foundation. To take care of the longitudinal expansion of the turbine copper expansion joints are provided between the condensers and the turbines. Large openings are left in the floor in front of the units to light and ventilate the condenser pit. Windows are provided under the turbine-room floor.

There are two motor-driven circulating pumps per unit, each having a capacity of 17,500 gal. (66,200 l.) per minute at the maximum head. Each pump when run by itself will furnish from 60 to 65 per cent of the amount of water that the two pumps together will furnish, on account of the reduced friction head. The condensate pumps are motor-driven and in duplicate, each being of 100 per cent capacity. One Le Blanc air pump of 100 per cent capacity is provided, and two steam air ejectors are provided for use in case of excessive leakage or for breakdown service. Three different sources of water are supplied for the Le Blanc pump—first, directly from the river; second, in case of flood, from a tank in the floor if the discharge pressure on the Le Blanc is higher than it will work under successfully; third, from the circulating system, in case the dam below the plant should fail and the suction head on the pumps should become too large.

As the power for the motor-driven auxiliaries is supplied by a house turbine and the exhaust steam from it is used to heat the feed water, there is an advantage in the Le Blanc pump in that it requires less steam

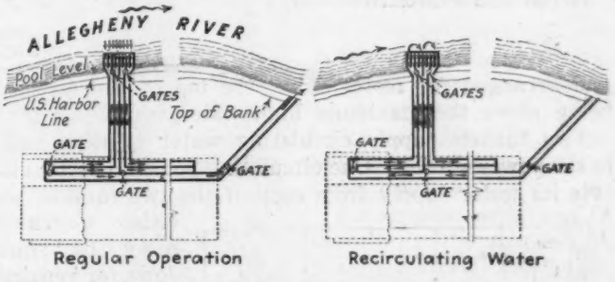


FIG. 9—PATH OF WATER FOR NORMAL OPERATION AND RECIRCULATION OF CONDENSER WATER

than the steam air ejector. However, the cost of the tank and the complication of the piping and floor space required add considerably to the expense of the Le Blanc air pump. There is not much complication in the steam air ejector, provided that the steam is discharged into an open heater. This means a possible difficulty in getting proper air separation. Where jet condensers are used for heaters, as in the Springdale plant, and it is desired to reduce the amount of air in the condensate and make-up to a mininmum, it is necessary to provide a surface condenser, into which the exhaust steam and air from the ejector are discharged. These gases are cooled by the condensate before it enters the heater. The additional cost of this surface condenser and the piping will offset the increased cost of the tank and piping required by the Le Blanc air pump.

The Springdale plant is about half a mile above the Springdale dam. The intake tunnels are placed low enough to insure that the power house will be able to operate in case of failure of the dam, provided that an additional 10 ft. or 12 ft. (3 m. to 3.7 m.) of gravel is dredged away from the intake.

The main intake trouble in the river is from ice and leaves. This is overcome by the installation of rotary

screens and arrangements for recirculating the discharge water, permitting it to be cooled by the ice and recirculating it through the condensing system. A modification of this scheme has been tried out at the Connellsville power station and at one or two other power stations which are subjected to similar trouble, and it has been found very satisfactory wherever tried. They are 6 ft. (1.8 m.) wide and arranged for motor drive, the top of the screens being above the maximum high water mark.

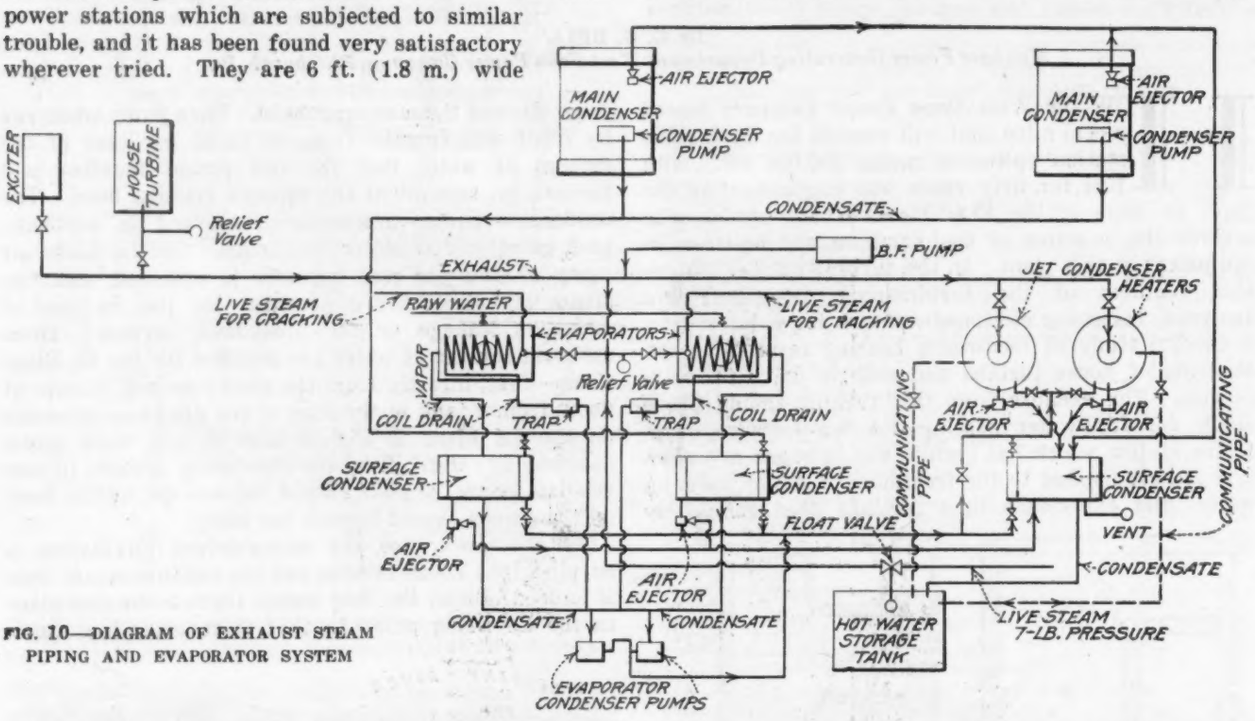


FIG. 10—DIAGRAM OF EXHAUST STEAM PIPING AND EVAPORATOR SYSTEM

Two tunnels supply circulating water to each unit in the power station. One circulating pump on each unit gets its water supply from each of the two tunnels, so either tunnel may be shut down for repairs and still permit of all units being operated at full or nearly full capacity. The double-intake tunnel system and means of recirculating the water also has the advantages of permitting the cleaning of the condensers while in operation. One circulating pump can be shut down and the dirt from the condenser washed through it into the tunnel by a partial reversal of flow in the condensers. All the auxiliaries in the plant, with the exception of one boiler-feed pump and one exciter set, are motor-driven. The station was originally laid out with the intention of putting in dual drives in order to maintain a heat balance. However, an investigation of the relative merits of turbine versus motor drive, using a house turbine to produce the power for the auxiliaries, showed that by adopting the house turbine nineteen turbines ranging in size up to 400 hp. and fourteen reduction gears could be omitted, and that the initial cost was less for the house turbine—that is, when the dual drive for the more important units, such as circulating pumps, had been provided. The house turbine also increases the over-all economy of the station by 2 per cent, as it produces unit energy with from 50 to 60 per cent of the amount of steam that a small turbine would take, considering the increased steam consumption at part load and at reduced speed on the smaller machines. There is at least an equal saving in the capacity of the large turbines which would be required to supply power to the auxiliaries, so that the net station capacity is increased. Taking into account the lower maintenance cost of motors as compared with small turbines and gears, especially considering the high steam temperatures and pressures, which entail special troubles, it seemed that the only logical thing to do was to adopt the house turbine.

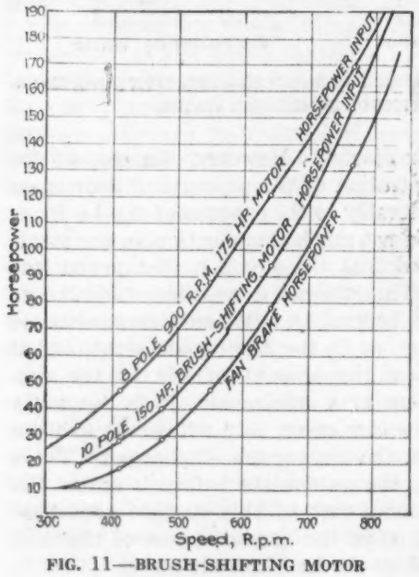

Horsepower
Speed, R.p.m.
8 POLE 900 R.P.M. 175 HP. MOTOR HORSEPOWER INPUT
10 POLE 150 HP. BRUSH-SHIFTING MOTOR HORSEPOWER INPUT
FAN BRAKE HORSEPOWER

FIG. 11—BRUSH-SHIFTING MOTOR ECONOMY

This type of motor was chosen for the forced-draft fans in the boiler room on account of its high efficiency compared to the slip-ring motor.

In order to heat the condensate to 210 deg. Fahr. (99 deg. C.) it is necessary that about 13 per cent of the condensate be available as exhaust steam. The amount of power consumed by the auxiliaries at the Windsor power station is 5.5 to 6 per cent of the total amount generated, and the amount of power required by the Springdale units should be about the same percentage. But, as the house turbine requires 125 per cent more steam per kilowatt-hour than the large units do, it appears that about the correct amount of exhaust steam is available.

One of the chief sources of trouble to electrically driven auxiliaries is lightning or surges on the line, and it has been customary in some stations to install motors of approximately 50 per cent excess capacity in order that the motors shall not kick off under such conditions. With a house turbine and dual auxiliaries, the

house turbine is connected to one bus, the other bus being connected to the large units through a bank of house service transformers, and where there are duplicate auxiliaries one is connected to each bus. In case of failure of either source of supply the other auxiliary still continues to operate. In case it is desired to keep a uniform feed-water temperature, the house turbine can be run parallel with the main units and the load on the house turbine controlled thermostatically, or load can be transferred by hand from one bus to another in the event that the house turbine is run separately.

The house turbine has also the advantage that in case of a complete station interruption it can be put on the line and be ready for service much more quickly than one of the big units. A motor-driven auxiliary plant has the additional advantage that on account of the elimination of the leaks in steam piping and around the governors on the smaller units the amount of make-up is very much less. Data on this point are limited, but practice in first-class plants seems to indicate that about 2 per cent make-up is required in the motor-driven plant as against 6 per cent in the steam-driven plant. The house turbine unit at Springdale power station is a 2,500-kva., 2,200-volt General Electric turbo-generator.

When the flow in the Allegheny River is very low there are traces of acid. This probably will increase as manufacturing increases up the Allegheny Valley, and manufacturing must extend this way. To take care of the water requirements of the plant a filtering system of 1,000,000 gal. (3,780,000 l.) per day was provided. This water will be used in the low-service system to prevent corrosion of piping through the plant and cooling coils in transformers and turbines. The make-up for the boilers is taken from the same source and is evaporated in two Griscom-Russell horizontal evaporators. These evaporators work between the pressure of the exhaust steam from the house turbine (2 lb. or 0.91 kg.) and a 23½-in. (59.2-cm.) vacuum, which is about the highest vacuum that can be maintained in the evaporator when working at full capacity and using condensate from the main turbo-generators as cooling water. By this arrangement the condensate is heated to about 125 deg. Fahr. (52 deg. C.) in the evaporator condensers, and it is then given a final heating in two Elliott jet condensers.

Both evaporators and jet condensers are provided with Elliott single-stage air exhausters to maintain a vacuum in the evaporator condensers and heater condenser, if desired. The arrangement also serves to extract the air from the make-up and gives a water supply for the boilers that should as nearly as possible eliminate corrosion. This is particularly important where steel economizers are contemplated. As far as is known, this is the first application of the low-pressure evaporator for power-plant purposes, although they have been employed in the sugar and other industries extensively. It has the additional advantage that at the low temperature in the evaporator there is very little tendency to form scale. An evaporator after being in service for a month and a half at a little higher temperature than it will ultimately work under is free from scale, the only foreign matter being a fine powder on the walls and coils. A plant equipped with a low pressure evaporator is about 1 per cent more economical than one with a high pressure evaporator unless the exhaust steam from the high pressure evaporator is bled into the exhaust end of the large turbines. There are, however, objections due to blade erosion and additional automatic stops which are necessary in these designs.

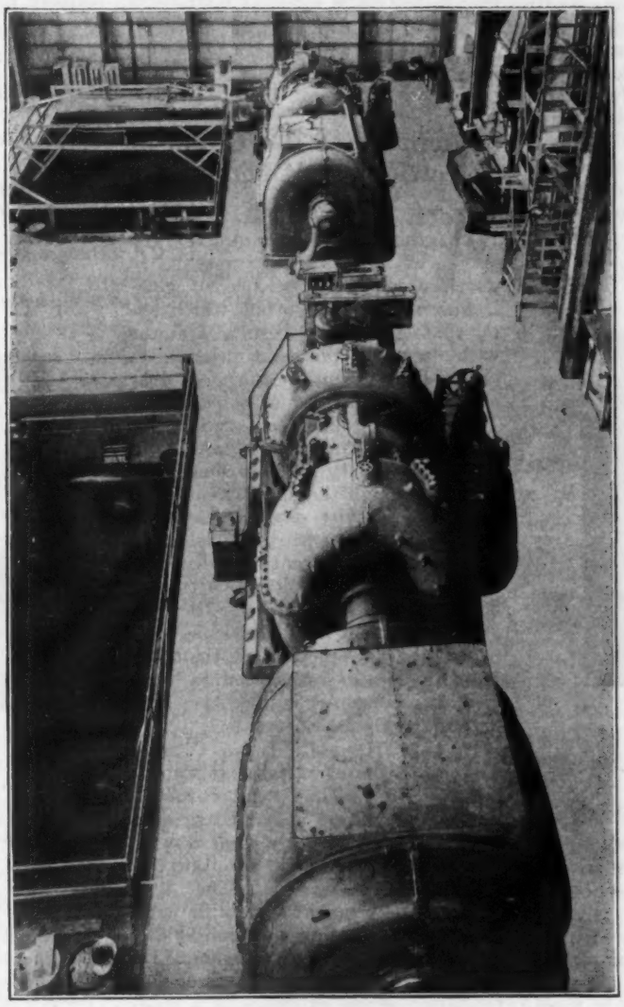


FIG. 12—VIEW OF TURBINE ROOM SHOWING TWO MAIN UNITS IN PLACE

As already mentioned in describing the house turbine, a motor-driven auxiliary plant has a comparatively small amount of make-up. This requires very close supervision of the condensers to see that the leakage is as low as it should be. It was originally contemplated to use the conductivity method to get a continuous record of the amount of condenser leakage, but the conductivity of the Allegheny River water was found to be so low that all of the manufacturers of equipment advised against the use of this method.

The storage tank used in conjunction with the evaporator and storage tank is intended to be kept full. If the water is drawn off below a certain level, steam is automatically admitted to the evaporator coils, the vapor being condensed and pumped directly into the condensate lines. In case there is a vacuum in the jet condenser, the water in the condenser will rise above the level in the tank; similarly, a slight back pressure can be taken care of in the same way.

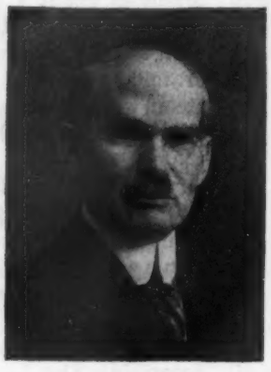
The Springdale power station was designed and constructed by Sanderson & Porter, in conjunction with the operating organization of the West Penn Power Company.

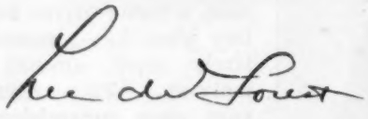
Hundredth Anniversary of Electromagnetism*

Oersted and Ampère Lived in Age of Discovery

IN CONSIDERING the vast scope of the sciences, the far-reaching ramification of the engineering arts which after one century stand upbuilded upon the discovery of Oersted and Ampère, one cannot but compare the value and lasting worth to mankind of such men with that of the philosophers, theologians and political reformers who during the same epoch announced "fundamental principles" and laid down "basic laws."

Theirs was an epoch of unrest, that of Oersted and Ampère—one of discovery and revolution in all lines of human activity—a renaissance of the intellect, the brushing aside of boundaries and barriers,





geographical and social, of striving for political and mental freedom.

Leaders, revolutionaries, discoverers sprang up in all lands in every realm of activity. It is but natural that an era which brought forth a Hegel, a Rousseau, a Kant, a Bonaparte should have given birth to such minds also as Oersted and Ampère—also enthusiasts unbound by tradition but in touch with the *realities* around them, courageous and diligent seekers after truth.

Not every century has opened a door to such immense realms of practical benefits as these two first entered, piloting the way for us. It may be many centuries before there is discovered a new force, so readily obtainable, so completely governed, and so applicable to the service of mankind, as are these twins electricity and magnetism. Oersted discovered and Ampère instantly appreciated and defined the laws of a force which more than any agent (save fire and steam) has been potent in shaping the civilization of the world. And what this first century has seen is merely a vague outline of the fullness of service which the ensuing ages will derive from the Oersted-Ampère discovery. If our descendants are a grateful race, those two names will grow in luster by each centenary, while those of philosophers and abstract mentalists will perish with each transient generation.

LEE DE FOREST,
De Forest Radio Telephone & Telegraph Company, New York City.

Centennial of the Union of Electricity and Magnetism

WE CELEBRATE this year the hundredth anniversary of the great researches which created the science of electromagnetics. The event which led to that fortunate result, fraught with so many material benefits to the world, are among the most dramatic in the history of science.

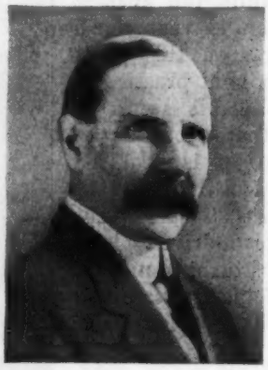
Electricity had been recognized since the days of Thales, and frictional electricity had become well known through the experimental researches of many physicists during the eighteenth century. The dawn of the nineteenth century witnessed the discoveries of voltaic electricity. There was no idea, however, that an electric current had any magnetic properties. Magnetism, on the other hand, had been recognized in relation to permanent magnets long before the Christian era.

In 1820 Hans Christian Oersted was professor of physics at Copenhagen. He had in his laboratory a battery of voltaic cells and a magnetic needle. He knew that a wire carrying the current in a voltaic circuit becomes heated. The idea occurred to him that a metallic wire, when heated in this way, might disturb a poised magnetic needle. He seems to have had no previous anticipation of the existence of a magnetic field around such a wire. He tried the experiment and found immediately a very marked and definite influence exerted by the wire upon the needle. This was not a thermal effect but a magnetic effect. The needle deflected strongly. There was no need for a microscope or a telescope. There was nothing but the voltaic battery, a piece of bare metallic connecting wire and the magnetic needle. Imagine his surprise and delight. In a few minutes of laboratory investigation the two sciences of electricity and magnetism that had been separate and absolutely distinct in human thought since the night of time were connected and became inter-related. Electromagnetics was born.

The news of this wonderful discovery spread among scientists like fire. Oersted's announcement was dated July 21, 1820, from Copenhagen, in Latin. The announcement reached Prof. André Marie Ampère, at the Ecole Polytechnique in Paris, on Sept. 11.

The news of the discovery stirred Ampère profoundly. He immediately set up a voltaic battery and some magnetic needles to repeat the experiment. Test followed test successfully, and Ampère could scarcely find time to sleep or eat. The French Academy of Sciences was scheduled to meet in Paris on Sept. 18. Within the intervening week Ampère prepared an epoch-making Academy paper, greatly extending the scope of Oersted's wonderful discovery.

With the precision and clarity that



have made French science famous for many centuries, he connected electricity and magnetism so definitely in experiment, in mathematics and in logic that ever since the two sciences have been inseparably associated.

A. E. KENNELLY,
Professor of Electrical Engineering Harvard University and Massachusetts Institute of Technology, Cambridge, Mass.

Letter from Dr. Jewett

In the issue of Sept. 18 the address of Dr. F. B. Jewett was erroneously given as the University of Chicago through the misplacing of type lines in the printing establishment. It is scarcely necessary to state that Dr. Jewett is chief engineer of the Western Electric Company, New York City.

*Other letters expressing appreciation of Ampère and Oersted's discoveries by Francis B. Crocker, Elihu Thomson, F. B. Jewett, R. A. Millikan, Edward L. Nichols, E. B. Rosa, and Carl Hering appeared in the Sept. 18 issue of ELECTRICAL WORLD.

Readers' Views and Comments

Shortage of Instructors

To the Editor of the ELECTRICAL WORLD:

SIR: There is an unprecedented shortage of younger teachers in engineering subjects, a shortage which, in connection with an increased registration of students, makes the situation in many technical schools almost critical. The "want columns" of engineering periodicals witness this shortage. Men in charge of apprenticeship courses in large manufacturing companies are overwhelmed with requests for men from numerous colleges. Inducements such as were unheard of in the pre-war days, when experienced instructors were paid as little as $750 a year, are offered to these "cub" teachers. Senior and even junior students of none too high scholastic standing receive several hundred dollars a year for what help they can give in reading and correcting papers and preparing experiments.

There are at least three reasons for this situation—an unprecedented demand for young engineers in industry, an increased registration of students, necessitating more instructors, and the inability of colleges on account of limited endowment to meet the necessary salary increases. These conditions will undoubtedly become more normal sooner or later, but in the meantime the deans and heads of departments are confronted with the necessity of an immediate solution.

Of course, after the almost insuperable problems of the war, when we were short of everything except trouble, this particular difficulty seems almost too tame to mention. But unless the situation is met wisely and promptly, we may have a generation of engineers with insufficient training just at the time when large projects of all kinds are pending to be executed within the next decade.

Just as many of our war difficulties proved to be blessings in disguise, so it is quite possible that the shortage in junior instructors may lead our more mature educators to reconsider some accepted methods of teaching in the light of modern psychological principles. Is it really necessary, or even desirable, to have recitations in numerous small sections conducted by immature instructors with little practical experience, with hardly any advanced theoretical training and with none of the point of view which comes with responsible professional work? Is it necessary to spend innumerable hours in the laboratory making electrical connections, taking performance curves, and then to spend more long hours at home writing reports? Is it necessary for the student to make detailed drawings of machinery, to compute fantastic dimensions for it, and to leave the school with the comfortable delusion that he "knows all about it"?

The underlying theory of all these methods of instruction which require a large number of young instructors is undoubtedly plausible. It is to give each student closer contact with a teacher, a contact impossible in lecture courses, and thus to clear up the difficulties in the student's mind as they come up. Incidentally the pupil is prodded along all the time and is not allowed to switch himself off at a siding for a rest. Another plausible theory is that through these instructors the student gets a practical training that will spare him embarrassment in the shop and make him immediately useful to his employer. The so-called "practical" instruction also adds to the student's interest, and smaller colleges make a feature of the "practical" nature of their curricula to attract students. All these features of modern instruction in engineering subjects came into vogue as a reaction against the earlier methods, when students were taught in large classes with hardly any textbooks, taking notes after the professors, who usually emphasized the physical and not the practical nature of the subject. There used to be little laboratory and computing work, and term examinations were the only check on the class. The old academic method certainly had its shortcomings, but is the present "kindergarten" method fundamentally very much better?

The technique of instruction is a specialty by itself, and only an expert body, such as the Society for Promotion of Engineering Education, assisted by representatives of the principal industries, is qualified to make a competent recommendation in the present emergency. Such a conference is apparently not in sight, and in the meanwhile I venture my humble opinion that the technical schools cannot go very far wrong by going back to the old-fashioned lecture system, with frequent examinations and reviews to keep the youngsters on the *qui vive*. With this change more weak students and misfits will fall by the roadside early in their scholastic career (and to insure their doing so is really to be charitable toward them), less ground will be covered in a perfunctory way, and less dexterity will be acquired in the laboratory. But as to the ultimate results, say ten years after graduation, we should be perfectly willing to give preference to high-caliber men who listened to mature teachers of national prominence, who had enough time to ponder and digest those lectures and to do some outside reading and reflection, who were not rushed with routine required work, and who thus carried with them the inspiration, the method of attack and the perspective which come only from thoughtful deliberation and association with a mature leader.

V. KARAPETOFF,
Cornell University.

Ithaca, N. Y.

Correction for New England Power Report

To the Editor of the ELECTRICAL WORLD:

SIR: In the writer's abstract of the New England power report, which was published in the Sept. 11 issue of the ELECTRICAL WORLD, two typographical errors appeared on page 526. The figure in the middle of the next to the last paragraph should have been 1,378,000,000 kw.-hr. per annum, instead of 1,378,000 kw.-hr., and similarly in the fourth line from the bottom in the last paragraph on that page the figure should have been 1,496,000,000 kw.-hr., instead of 1,496,000 kw.-hr. In the latter case, however, I believe it is perfectly obvious from the context that this is an incorrect value, and I presume that any one who studies the relation between 323,000 kw. and 1,378,000 kw.-hr. in the preceding paragraph will perceive that three ciphers were omitted here also.

CARROLL H. SHAW.

New York City.

Station and Operating Practice

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

Cleaning Condensers Saves One Fireman on Two 3,000-Kw. Turbines

AS A RESULT of thoroughly cleaning the condensers used with two 3,000-kw. turbines one fireman per shift was eliminated besides saving coal and freeing one 500-hp. boiler in the Newark (Ohio) plant of the American Gas & Electric Company. In checking up on the condensers in this plant use was made of Table II, shown below, giving vacuum pressures corresponding

TABLE I—HOW VACUUM WAS INCREASED BY CLEANING CONDENSER TUBES

	Discharge Temperature, Deg. Fahr.	Injection Temperature, Deg. Fahr.	Vacuum, In.	Barometer, In.
Before cleaning	89	69	25.75	29.5
After cleaning with hose	87	68	26.75	29.4
After scraping	66	50	28.35	29.54

to different temperatures of discharge water. This table, compiled by the writer, has been found reliable for such checks provided the condensers are of about the proper size for the amount of steam used. There may be some variation from the table with changes in the barometer or when the temperature of the injection water is higher than 80 deg. Fahr. (27 deg. C.), but this variation will not be great.

On an inspection of this plant it was noticed that with a discharge temperature of 89 deg. Fahr. (31.6 deg. C.) the vacuum was only 25.75 in. (655 mm.), while, according to the table, for this temperature the vacuum should be 27.6 in. (702 mm.). This discrepancy of 1.85 in. (47 mm.) indicated trouble in the condensers and therefore each tube was washed out with a hose. As a result the vacuum increased to 26.75 in. (670 mm.)

TABLE II—RELATION BETWEEN TEMPERATURE OF DISCHARGE WATER AND VACUUM IN CONDENSER OPERATING PROPERLY

Temperature of Discharge, Deg. Fahr.	Vacuum, In.	Temperature of Discharge, Deg. Fahr.	Vacuum, In.
68	28.3	93	27.4
72	28.2	99	27.1
79	28.0	104	26.8
84	27.8	108	26.5
89	27.6		

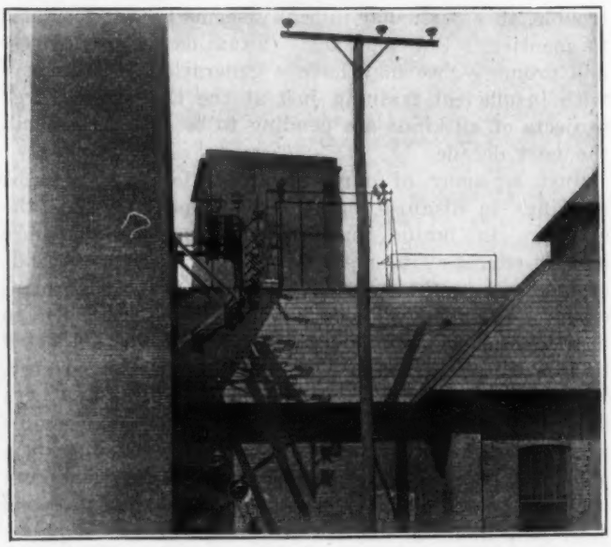
with a discharge temperature of 87 deg. Fahr. (30.5 deg. C.). As this, however, was still below the vacuum given in the table, the tubes were scraped with a standard tube cleaner. After this cleaning the vacuum increased to 28.35 in. (721 mm.) with 66 deg. Fahr. (19 deg. C.) discharge water.

This high vacuum reduced the steam consumption on the turbines to a point where one less boiler took care of the load nicely. After this cleaning one fireman per shift was laid off and one 500-hp. hand-fired boiler was released from service, besides which an appreciable saving in coal was effected. It might be mentioned that each condenser, although connected to a 3,000-kw. turbine, has only 6,000 sq.ft. (560 sq.m.) of surface or 2 sq.ft. (0.19 sq.m.) per kilowatt, which is rather low compared with the average installation of about 2.5 sq.ft. (0.23 sq.m.) per kilowatt. A. L. PLATT.

Newark, Ohio.

Anchoring a Transmission Line to an Old Chimney

A 33,000-VOLT incoming line is anchored to an old brick chimney of a substation of the Concord (N. H.) Electric Company in somewhat unusual fashion by the structural steel attachment shown in the accompanying halftone. The line is dead-ended on insulators held on an angle-iron framing, taps to the lightning arresters being carried downward through discharge gaps and choke coils and thence run into the building through wall bushings. The upper sets of insulators are carried on 4-in. (10-cm.) angles and the lower set on 2½-in. x ½-in. (6-cm. x 1.2-cm.) strap iron. The transformers are installed with the lightning arresters in the old brick structure, which was formerly a steam generating station. The transformer connections are



CHIMNEY OF OLD STEAM PLANT SUPPORTS INCOMING 33,000-VOLT LINE

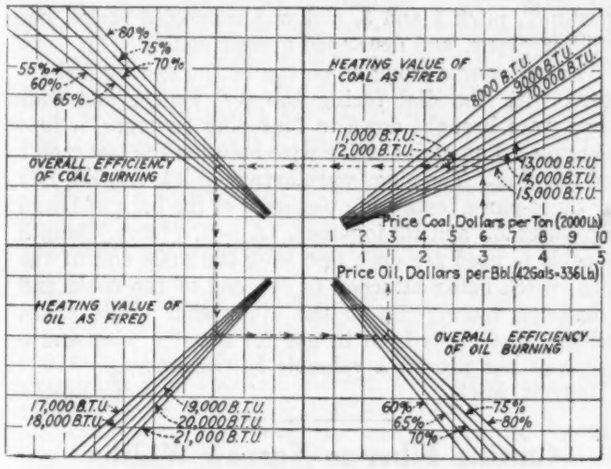
run from the upper dead-end terminus of the line (not shown in the photograph) to horizontal leads carried on insulators supported on pipe framing above the roof level, from which drop leads are carried to the transformers within the building. L. J. CHASE,

Concord Electric Company, Manager.

Concord, N. H.

Costs of Coal and Fuel Oil Compared by Chart

THE accompanying chart shows what the price of oil of different grades must be in order to compete with coal of various grades at varying prices. If the cost of coal, its B.t.u. heating value and the over-all efficiency at which it is burned are known, the chart shows how to find the price at which oil will compete, considering the different heating values of the oil and the over-all efficiency which may be obtained with oil burning. The example worked out on the chart shows six-dollar coal of 14,000 B.t.u., burned at 70 per cent over-all efficiency, as comparable with oil at $1.45 a



COMPARATIVE FUEL COSTS OF COAL AND OIL

barrel, 19,000 B.t.u., and used with an over-all efficiency of 75 per cent. This chart takes into account only the cost of the two fuels and does not take into consideration operation costs such as labor, maintenance or the first cost of the plant. It should be noted that the B.t.u. of both the oil and the coal are based on fuel as fired. Taking 18,250 B.t.u. for the heating value of the oil and 14,000 B.t.u. for the corresponding heat content of the coal, we would have to burn 4.56 barrels of oil to equal a ton of coal. This is assuming equal over-all efficiencies.

F. H. DANIELS,
General Manager.
Sanford Riley Stoker Company,
Worcester, Mass.

Cost of Maintaining Equipment in 60,000-Kva. Plant

ITEMIZED maintenance costs of electrical equipment in the steam plant (Station G) referred to in the article "Analyzing Maintenance Costs," on page 613 of the ELECTRICAL WORLD for Sept. 25, are given in the accompanying table.

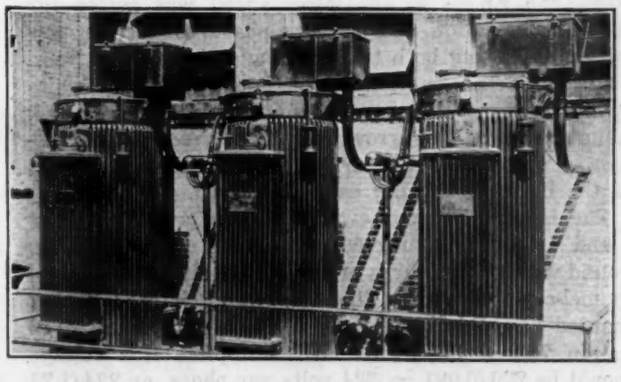
This New England plant was built about nine years ago, and in the last two years, for which the data are given, it has changed from 43,100 kva. to 63,100 kva. in rating. During these two years it has generated 144,844,900 kw.-hr. Switchboard maintenance is seen to be the most expensive item, constituting about 35 per cent of the total electrical repairs, while auxiliary motors take 28 per cent.

The total cost of electrical equipment repairs per kva. of station capacity for the two years was: Generators, $0.038; switchboard, $0.09; batteries, $0.02; motors, $0.074; wiring, $0.041; total, $0.263. Electric plant repairs represented 0.84 per cent of the total station operating expense, and of this small proportion switchboard and wiring maintenance accounted for 0.53 per cent of the total operating expense, other items being smaller. The electrical repair cost per kilowatt-hour manufactured in the two years was only 0.0088 cent. Compared with steam-plant repair expenses the cost of electrical repairs is relatively small, these being only slightly more than $500 per month, against nearly $5,000 per month for steam equipment repair.

MAINTENANCE COST FOR ELECTRIC PLANT EQUIPMENT 1918-1920. STATION RATING VARIED FROM 43,100 TO 63,100 KVA.
DOLLARS EXPENDED IN REPAIRS

	Labor					Materials					
	Generators	Switchboards	Batteries	Motors	Wiring	Generators	Switchboards	Batteries	Motors	Wiring	Total
1920											
June	214	73	5	83	4	2	272	25	37	0	715
Mar.	44	4	4	55	4	11	41	0	105	0	268
Apr.	23	63	12	58	6	8	10	0	135	0	214
Mar.	34	115	3	39	15	0	0	0	7	1	315
Feb.	23	92	9	52	54	2	23	12	9	2	278
Jan.	19	89	2	52	359	29	60	0	7	6	623
	357	436	35	339	442	52	406	37	300	9	2,413
1919											
Dec.	35	32	5	103	109	221	0	0	3	0	508
Nov.	17	40	6	79	84	27	60	0	5	1	319
Oct.	5	31	4	166	29	4	1	0	268	72	580
Sept.	9	97	2	232	4	28	57	0	245	61	735
Aug.	13	50	11	366	42	9	10	0	165	9	675
July	19	86	1	85	25	46	69	8	6	13	358
	98	336	29	1,031	293	335	197	8	692	156	3,175
Year	455	772	64	1,370	735	387	603	45	992	165	5,588
1919											
June	45	149	46	32	4	32	1,549	7	27	5	1,896
May	19	183	89	30	12	32	23	87	0	9	484
Apr.	36	124	70	11	36	326	414	449	365	5	1,836
Mar.	61	3	5	82	68	0	0	0	0	55	274
Feb.	21	104	0	22	348	2	0	0	0	118	615
Jan.	29	45	0	45	49	6	45	0	0	97	316
	211	608	210	222	517	398	2,031	543	392	289	5,421
1918											
Dec.	36	38	0	37	0	20	27	0	75	86	319
Nov.	52	65	0	82	0	34	3	0	0	55	291
Oct.	47	11	0	71	0	29	1	0	47	57	263
Sept.	33	97	0	59	0	9	19	14	0	9	240
Aug.	61	32	0	84	0	5	17	0	0	20	219
July	38	18	0	56	0	25	38	0	11	71	257
	267	261	0	389	0	122	105	14	133	298	1,589
Year	478	869	210	611	517	520	2,136	557	525	587	7,010
Two years	933	1,641	274	1,981	1,252	907	2,739	602	1,517	752	12,598

Transformers Made Weatherproof



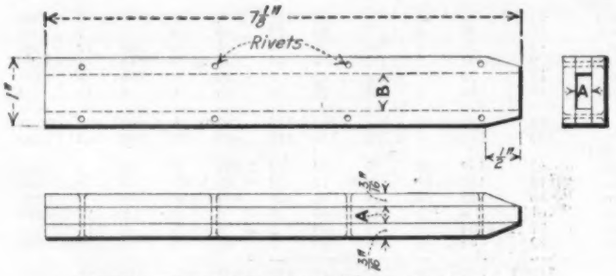
WEATHER protection of this bank of 667-kva. transformers has been accomplished by placing a housing over the high tension bushings. The 2,300-volt cables terminate in end bells which are within the weatherproof boxes mounted on top of the transformers. The 575-volt leads are taken out of the transformers through the regular bushings. The installation is at the Pacific Mills at Lawrence, Mass.

Industrial Applications

The Economical Utilization of Electrical Energy in Mills and Factories, Together with Practical Details of Installation, Control, Testing and Repair of Equipment Required

Device Which Holds Motor Wedges While Driving Them Into Place

MOTOR wedges are easily held in position for driving them into the slots by means of a device developed in a New York repair shop. The drivers are made of five pieces of cold-rolled steel with the front end tapered to permit of working in restricted spaces. When



A LOOSELY FITTING PLUNGER 7¾ IN. LONG FITS INTO THIS WEDGE DRIVER

using the driver the wedge is placed in the chamber with ¼-in. (6 mm.) projecting. The plunger is inserted from the rear and driven by a rawhide mallet. The sizes most used have *A* and *B* dimensions respectively 7/16 in. (1.6 mm.) and 7/16 in. (11.1 mm.), 3/16 in. (1.9 mm.) and 7/16 in. (11.1 mm.), and ⅛ in. (3.1 mm.) and 9/16 in. (14.2 mm.).

C. A. JOHNSON.

Bronx, New York City.

Rewound Motor for Testing Phase Rotation

FOR checking phase rotation an Eastern repair shop rewound a 1½-hp., three-phase, 60-cycle, 220-volt, 1,050-r.p.m. motor to two phase, 440 volts, twenty-four poles, 265 r.p.m., as the lower speed was better for observing rotation and the two-phase connection permitted of testing both two-phase and three-phase lines. To assist further in noting direction of rotation a white arrow was fixed to the end of the shaft and a black disk mounted behind the arrow on the end frame, the direction in which the white arrow slowly revolved in front of the black disk being easily observed.

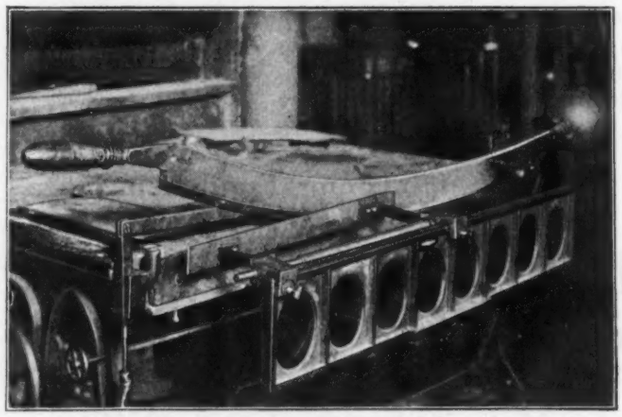
The motor had forty-eight slots and a coil pitch of 1 and 7; it was connected series-star, each coil being wound with twenty turns of two No. 19 single-cotton and enamel-covered wire. The six-pole pitch of 1 and 7 chorded has a chord factor equal to $\sin(7 \times 180/8)/2 = \sin 78° 0' 45'' = 0.9807$. Full-pitch line voltage should be $220/0.981 = 224$ volts per phase, or $224/1.73 = 129$ volts star. This winding will then be good for $(3 \times 129)/2 = 188\frac{1}{2}$ volts for two-phase series connection. The number of turns per coil required for two-phase, 440 volts, twenty-four poles, is $20(440/188.5) \times 24/6 = 186$ turns for full pitch. The turns being increased 9.3 times, the cross-section of copper was decreased in the same proportion, the size nearest correct being No. 25; but as the proper number of turns of No. 25 more than fill the slots, No. 27 was used. As rewound, the motor had forty-eight coils (two-layer winding), pitch 1 and 3, and was connected series, one coil per group, and developed approximately ⅓ hp.

The motor was mounted on top of the testing switchboard with the dial facing the test bench, and four wires were brought down to four plug switches, a fuse being placed on each outside wire between the test motor and the plug. The plugs were arranged A1, A2, B2, B1; for three-phase tests a lug was used at the back of board to connect A2 and B2 together. A 6-ft. (1.8-m.) length of cable is used for each test lead, the male end of the plug switch being attached to one end of the cable and a bull-dog testing-clip to the other end. This phase rotation tester has been in use for about a year and a half and has proved a valuable instrument.

Detroit, Mich. A. C. ROE.

Cutting Fiber to Narrow Widths

TO CUT fiber in very narrow widths the American Electric Service & Maintenance Company, Springfield, Mass., designed the home-made gage illustrated herewith for attachment to a paper cutter. The gage consists of a straight bar, 21 in. long, 1¾ in. high and 3/16-in. wide (44 cm. x 4.5 cm. x 4 mm.), attached to angle pieces which are seated against two sliding blocks arranged to move back and forth as required on the regular stop of the cutter. A ½-in. (1.3 cm.) rod con-



AUXILIARY BAR ON STOP OF PAPER CUTTER ADJUSTABLE FOR CUTTING VERY NARROW STRIPS

nects the sliding blocks and is fitted with a spring to hold the gage in a horizontal position parallel to the face of the cutter. The gage can be fixed in any position along the cutter by set-screw adjustment, and the fiber can be cut to hair widths if desired.

Boston, Mass H. KNOWLES.

Forty-Cycle Motors Operated on 60 Cycles to Utilize Old Equipment

THAT a 40-cycle motor has more desirable characteristics when operating on 60 cycles at the same voltage than a standard 60-cycle motor proved to be true when a central station recently made tests to find out if its service could replace a 40-cycle isolated plant without necessitating the purchase of new motors. Of course in buying new equipment 60-cycle motors are more economical on 60-cycle energy, but this case involved only the utilization of old motors efficiently. The utility had both 25-cycle and 60-cycle service available, and after testing a 40-cycle motor at the same voltage on all three frequencies the isolated plant was shut down, 60-cycle service was installed and smaller pulleys were put on the motors, which have been operating satisfactorily for the past three years.

It might be thought that the power factor would be worse on the higher frequency, but the reverse is actually the case. A 40-cycle motor contains more iron than a standard 60-cycle motor, and with the constant voltage the increase in frequency reduces the magnetizing current, and this results in higher power factor.

The test results showed that on 25 cycles the free running current of the motor was over 125 per cent of the rated full-load current on 40 cycles, while on 60 cycles the free running current was but a little more than one-half that at 40 cycles. Using the tests on 40 cycles as a basis, the 60-cycle results showed 14.5 per cent less free-running watts and the 25-cycle test 136 per cent more. The free-running current on 25 cycles was so high that no full-load test was attempted.

A partial load test was applied long enough to observe some readings, which showed that the motor could not be satisfactorily operated at 25 cycles.

TESTS OF 20-HP., 220-VOLT, THREE-PHASE, 40-CYCLE MOTOR ON 40 CYCLES, 60 CYCLES AND 25 CYCLES

Volts	Amp.	Input, Watts	Brake, Hp.	Per Cent P.F.	R.p.m.	Remarks
			40 Cycles			
232	.....	.....	....	..	....	Open circuit.
....	160	.....	....	..	....	Starting free.
230	21.5	1,660	....	19	800	Running free.
221.5	30	8,800	11.8	67	790	
221.5	39	12,020	16.1	80	790	Brake tests.
220	46.5	14,920	20	84	780	
218	54	18,005	24.1	88	780	
			60 Cycles			
230	.....	.....	....	..	....	Open circuit.
218	100	.....	....	..	....	Starting free.
228	11.5	1,420	....	31	1,200	Running free.
230	12	2,420	3.2	50	1,200	
229	19	4,500	6.0	59	1,198	
227.5	22.5	7,000	9.4	78	1,196	
224	33	10,900	13.3	83	1,187	Load obtained through belt-driven generator. Motor operated very well.
220	43.5	14,000	18.8	87	1,177	
217	51	17,230	23.1	90	1,170	
213	60	20,120	26.9	91	1,165	
207	74	24,200	32.4	92	1,157	Short overload test.
			25 Cycles			
231	.....	.....	....	..	....	Open circuit.
202	220	.....	....	..	....	Starting free.
228	64	3,920	....	15	498	Running free.
225	67	10,800	10.5	30	498	Load obtained through belt-driven generator.

The slip at 23 hp. to 24 hp. was about 2½ per cent on both 40-cycle and 60-cycle service. When the load at 60 cycles was increased to 32.4 hp. the slip increased to about 3½ per cent, but the motor gave no indication of stalling.

The motor used for these tests was a 20-hp., 220-volt, three-phase, 40-cycle, 800-r.p.m. synchronous-speed General Electric type I, form K squirrel-cage motor, with its regular type of compensator.

C. W. LEONARD.
Union Electric Light & Power Company,
St. Louis, Mo.

Blanks for Recording Photometer Tests

FOR conveniently recording data of lamp and reflector tests made for industrial plants the test record sheet here illustrated was devised by the writer, who has found it to be very useful during the past year. It is in the form of a blue-line print (such as can be made in any drafting room) the color and surface of which permit the use of ink for recording the data. It provides spaces for the recording of all information for the distribution and absorption comparisons usually required by the user of accessories.

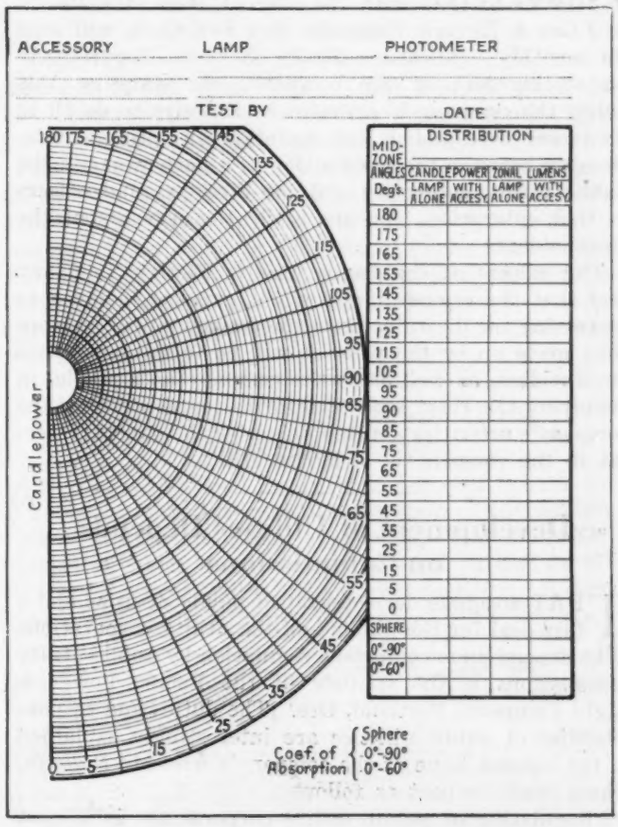


CHART FOR RECORDING PHOTOMETRIC TESTS

Industrial plants are now learning that it is of value to give time and study to the selection of lighting units. Although reflector and lamp manufacturers are striving to standardize the shapes of reflectors, there are a number of things which cause some makes to be better than others. As the best way to determine the performance of lamps in their shades, reflectors or other accessories is by making photometric tests, the purchase of a suitable photometer for making such tests has been shown to be a paying investment where there is an employee available who is capable of making such tests and using the results. As an alternative an illuminating engineer should be retained to test the accessories under consideration and to recommend the selection of that which is most desirable for the application.

Pittsburgh, Pa. D. W. BLAKESLEE.

Central Station Service

A Department Devoted to Commercial Policy and Management Topics, Including Methods of Increasing the Use of Electric Light, Power and Heat

Pacific Gas & Electric Stockholders to Receive Company Magazine

COMMENCING with the current issue, the Pacific Gas & Electric Company, San Francisco, will send its monthly publication, *Pacific Service Magazine*, to all stockholders of the company. In adopting this policy the company is actuated by a desire to do all in its power to establish and maintain an intimate relationship between the stockholder as a part owner in the public utility enterprise and the directors and officers of that enterprise, who are really the servants of the stockholders.

The officers of the Pacific Gas & Electric Company feel that the comparatively slight expense involved in increasing the distribution of the magazine will be more than made up by the value it will be to the company's stockholders, as well as to the company as a whole, in supplying the right kind of information concerning the company's activities and keeping alive the general interest in the company as a public utility.

Development of Utilities Depends on Commissions

THAT adequate development of public utilities and a fair deal for the public and the utility corporations alike depend upon competent regulation by public utility commissions is the attitude of the Pacific Power & Light Company, Portland, Ore. The duties and responsibilities of public utilities are interestingly explained in the current issue of the company's monthly *Bulletin*, which reads in part as follows:

"Regulation of public utility corporations is a most serious and responsible undertaking. The public utility is the vendor of an essential service. It is an important factor in the industrial development of the community it serves. The investment in the public utilities of each state amounts to millions of dollars. It is generally the largest single investment in any community. The kind of service a public utility renders is dependent upon the efficiency and economy of its operation, and the development of its service is determined by the nature and protection of its credit. Public utility statutes vest in commissions of regulation almost unlimited powers of supervision and control. Commissions determine standards of service, classification of accounts, values, rates and return. The service and development of our public utilities are measured by the character and intelligence of the personnel of commissions. The technique of engineering and accounting, operating practices and the economics of production, distribution and finance are the problems of regulation. Their solution requires judgment and learning that are the result of study and experience. The public good of regulation will depend for its success upon those who regulate. It is a question of men and not of laws. The state with the best public utility laws and the least capable commission will not have such good regulation as the state with the worst laws and most capable commission.

"The public does not properly appreciate the importance of a public utility commissionership, and it should come to know the duties and responsibilities of such an office in order that it may be less influenced by the expediencies of practical politics. It should have a dignity and importance in the public mind that will lift it above the strife for partisan advantage. Regulation is correct in principle and can be made right in practice if commissions are efficient in personnel. Commissions must be capable, independent and permanent in order to be efficient, fair and just. There must be knowledge and experience. The term of office should not be governed by the vicissitudes of politics. It is unduly burdensome and unfair to the public and public utility alike to be constantly educating a new commissioner in the problems of the public utility industry in order that political obligations may be discharged or partisan advantage bear fruit. One of the problems of today is to take regulation out of politics and to make commissioners responsible to their judgment of what is fair, just and reasonable, uninfluenced by the rant and cant of the demagogue and the cupidity of the politician."

Better Accounting Methods Necessary

THE prime thing for every utility to know and to let the public know is whether the net income from operations is sufficient, declared J. A. C. Kennedy, general counsel of the Nebraska Power Company, at the recent Omaha convention of the Nebraska Section of the N. E. L. A. To know this, Mr. Kennedy continued, involves thoroughly understanding modern accounting. The ordinary business man, however, has not heretofore sought to master this very important phase of the business. An official of so large a corporation as the Nebraska Telephone Company said that that company had never made money in Nebraska, because it was only in the last few years that its officials had learned how to keep their accounts properly. The greatest error by this company in its earlier years was a neglect to charge annually a sufficient depreciation expense. The result was a colossal increase in the operating expenses when the time came, as it was bound to come, to junk the antiquated switchboards, receivers, etc. Had a proper depreciation charge been annually made in anticipation of this inevitable day of reckoning, the funds would have been at hand with which to replace the obsolete property, instead of the company being compelled to take the necessary funds out of the immediate year's receipts. If such has been

the experience of this great corporation, Mr. Kennedy said, it is certain that many smaller utilities of all kinds have gone along blissfully ignorant of their failure, because of inadequate accounting methods, to charge enough for the service rendered.

If the great value of an adequate accounting system was fully appreciated by every utility company, there would not be a moment's hesitation in adopting such a system. It is the common experience that the installation of an adequate accounting system gives a new tone to a business. It dignifies it and gives the management a distinct pride. This is true because the manager has an accurate monthly picture of all of his company's operations, from a study of which he may not only devise ways and means of improving the financial condition of his company but, in addition, be prompted to devise methods for the improvement of the company's physical condition and its capacity for giving better service. The public is not only interested, therefore, in having such an accounting system as will reflect the actual financial condition of the company, but its interest goes to the improved service that almost inevitably follows the installation of such a system. Furthermore, the speaker held, the demands of the income-tax law and of the regulatory bodies are making accounting more important than it has ever been before, and the men in the electric lighting and power fields who will have the greatest measure of success are those who will give careful attention to the perfection of their accounting systems.

Utility Maintains Customers' Lighting Equipment

NEARLY 37,000 customers' lighting units are being maintained by the Commonwealth Edison Company of Chicago at a fixed rate per lamp per month. Customers' 100-watt to 500-watt lighting fixtures are maintained during the life of the contract for electric service at the rates shown in the table below.

The price charged for the maintenance service includes the original installation of lamps and all renewals thereof except that in the case of signs the customer pays an additional sum for the original installation of lamps and all renewals. In order to obtain this service a customer must contract for the maintenance of all units of 100 watts and over. The company cleans the lamps, globes and reflectors at least once a month, and where special factory conditions require more frequent cleaning it makes a practice of cleaning the lamps twice a month without extra charge. The maintenance does not include repairs or painting of equipment, and the customer is held responsible for any lamps that have been broken or removed from the sockets.

Equipment	Net Monthly Charge per Fixture
200-Watt Mazda "C" store fixture	$0.37
300-Watt Mazda "C" store fixture	0.43
400-Watt Mazda "C" store fixture	0.48
500-Watt Mazda "C" store fixture	0.48
100-Watt Mazda "C" factory fixture	0.26
200-Watt Mazda "C" factory fixture	0.32
300-Watt Mazda "C" factory fixture	0.37
400-Watt Mazda "C" factory fixture	0.42
500-Watt Mazda "C" factory fixture	0.42
	Per Socket
Sectional sign*	0.01½
Panel sign*	0.05
	Per Bracket
300-Watt Mazda "C" exterior bracket	1.20
500-Watt Mazda "C" exterior bracket	1.25
	Per Post †
300-Watt and 500-watt Mazda "C" private street post	1.50

*Minimum charge $6 per year. †Including switching.

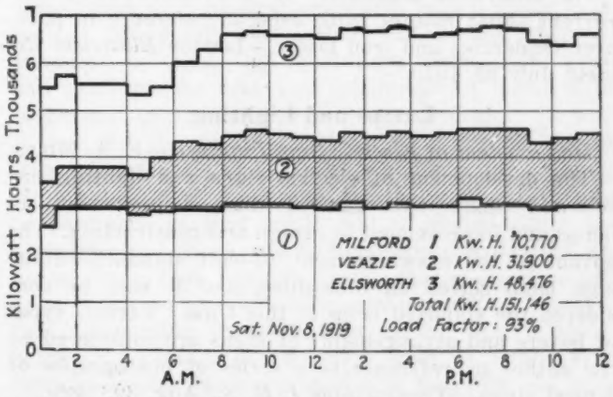
The present form of agreement has been in force since March 1, 1920, and supersedes a previous contract under which lighting units were installed and maintained. About five months after the present maintenance arrangement became effective the company was maintaining 36,840 lighting units exclusive of signs, as shown in the following table:

Inside store fixtures	18,835
Outside bracket fixtures	752
Factory units	16,920
Street posts	333
Total	36,840

Although more inside store fixtures were being maintained than any other type at that time, most of the new contracts taken were for the maintenance of factory fixtures which are expected to exceed the totals of all other fixtures combined. There was an average of about three fixtures to every customer when the above figures were given out, but the number of fixtures per customer is expected to grow with the increase in the number of industrial customers who avail themselves of the maintenance service. Lighting salesmen receive a commission of 25 cents per socket for all maintenance contracts secured.

High Load Factor Results from Long-Hour Business

AN AVERAGE load factor of 85 per cent is obtained regularly on the generating system of the Bangor (Me.) Railway & Electric Company and controlled properties, which supply energy to a varied load in the central Penobscot Valley and adjacent territory. Hydroelectric stations at Milford, Veazie and Ellsworth serve diversified industries, large paper mills, electric railway, and commercial lighting and power business. A typical load curve of an all-day-and-night load factor of 93 per cent is shown herewith, the combined outputs of the various stations from hour to hour being indicated by the broken lines. The individual outputs of the stations are represented by the areas between these lines. The stations were rated as follows at the time the readings were taken: Ellsworth, 2,250 kw.; Milford, 3,200 kw.; Veazie, 1,600 kw. Edward M. Graham is vice-president and general manager of the company.



COMBINED HOURLY LOAD CURVES FOR ALL STATIONS OF BANGOR RAILWAY & ELECTRIC COMPANY'S SYSTEM

Digest of Electrical Literature

Including Brief Abstracts of and References to Important Articles Appearing in the Scientific and Engineering Press of the World

Generators, Motors and Transformers

Periodic Self-Excitation in Direct-Current Machinery.—LEYERER.—In experiments with a large turbo-generator with exciter-dynamo an instability was observed that under certain conditions caused a periodic self-excitation of the exciter machine, first in one direction, then in the other, so that the system actually generated alternating current of very low frequency. The rotor of the turbo-generator was connected directly to the exciter, in parallel with the exciter field winding, and a regulating rheostat was inserted in series with the exciter armature. When this rheostat was cut down to minimum resistance the system ran smoothly and the exciter current was stable. At a given resistance value disturbances set in. The current rose slowly and then decreased to zero. After a while the exciter would reverse its polarity, and the same phenomenon repeated itself. When the regulating rheostat was adjusted to still higher resistance values the current reversals became more rapid and the curent amplitude lower, until, above another limiting resistance value, the oscillations ceased altogether and the current remained zero. The author presents a mathematical theory of the phenomenon and shows under what conditions instability and periodic excitation may occur.—*Archiv für Elektrotechnik,* July 8, 1920.

Variable Speed, Shunt-Wound Direct-Current Motors.—An analytical treatment of the design of direct-current shunt motors, with especial reference to flash-over tendencies and iron losses.—London *Electrical Review,* July 23, 1920.

Lamps and Lighting

Development of Electric Sign Lighting.—E. A. MILLS.—The development of electric signs and lighting has followed along two general lines—improvement in lamps and improvement in design and construction. The advent of the drawn-filament 10-watt standard-voltage sign lamp solved all difficulties, and it may be considered the standard lamp at this time. Various types of letters and arrangements of signs are considered by the author by reference to a series of photographs of typical signs.—*Transactions I. E. S.,* Aug. 30, 1920.

The R.L.M. Standard Reflector for Industrial Lighting.—WARD HARRISON.—The writer calls attention to the fact that the R.L.M. specification provides (a) a durable and highly efficient reflecting surface, (b) a contour of reflector which will insure an effective light distribution, and (c) a depth which will cut the filament center off from view at an angle of 72½ deg. from the vertical axis, thus screening the light source to minimize glare. He states that a photometer has been developed with which the reflection factor of porcelain-enameled steel surfaces of a given contour may be indicated by one reading. In explaining the difficulties in using the tungsten gas-filled lamp with various types of reflectors, some information is given regarding the bowl-enameled lamp which has been developed for use in dome reflectors. The enameling is a superficial coating which is applied to the bowl of the lamp and is carried to the point opposite the lowest part of the filament. As regards durability, the author states that it will resist practically any mechanical abrasion it is likely to encounter. Repeated tests have shown it to be proof against deterioration by acid fumes. Because of its smoother surface, this lamp does not collect dirt so readily as a frosted lamp. When used with the R.L.M. dome reflector, the lower part of the lamp becomes virtually a semi-indirect bowl, serving the same purpose as heretofore has been accomplished by the opal cap. In combination with the bowl-enameled lamp the R.L.M. standard dome reflector provides an equipment that will meet the requirements of a large percentage of industrial plants.—*Transactions I. E. S.,* Aug. 30, 1920.

Generation, Transmission and Distribution

Electricity in Spain.—BLUMENTHAL.—This article gives a review of the present development of electrification in Spain and also touches upon some plans which are on foot aiming at the utilization of a considerable part of the 5,000,000 hp. estimated water power available. So far about 900,000 hp. has been assigned on concession, but less than 400,000 hp. had been developed in 1917. Richest in hydraulic power among the Spanish rivers is the Ebro, with 1,130,000 hp. Next comes the Douro with 90,000 hp., the Guadaquivir with 75,000 hp., and the Tajo with 70,000 hp. Statistical data regarding the eight biggest power companies and their present plants are given. The author also discusses the productivity of the Spanish electrical manufacturing industry. The article is evidently meant to advise German interests on the possibilities for selling electrical machinery and supplies in Spain.—*Elektrotechnische Zeitschrift,* April 1, 1920.

Installations, Systems and Appliances

Design of Electrical Installations for Ships.—C. H. WORDINGHAM.—The writer covers briefly questions of generation, distribution and utilization of electricity on shipboard, including the electric propulsion of ships.—London *Electrician,* Sept. 3, 1920.

Portable Oscillograph.—J. W. LEGG.—It is stated that it has become more and more desirable to have a portable commercial oscillograph, extremely compact and light in weight, for work outside of the laboratory. The writer describes such an oscillograph and ascribes to it the following advantages: (1) Special compactness of apparatus; (2) use of an incandescent lamp with special arrangements to obtain very great intrinsic brilliancy; (3) mechanically operated focal-plane shutter; (4) remote-control switch to cause transient to appear at any desired part of the film; (5) trip magnet to

operate remote-control switch and shutter immediately after abnormal voltage is applied to the incandescent lamp; (6) lamp-extinguishing switch to prevent the filament from being destroyed; (7) self-contained storage battery to supply galvanometer field; (8) switch for placing ammeter in galvanometer field or battery-charging circuits; (9) element resistances and control panel for commercial voltages; (10) all the above apparatus mounted in a single case 13 in. x 14 in. x 25 in. (33 cm. x 36 cm. x 63 cm.) over all and weighing but 82 lb. (37 kg.); (11) transformer for 110 volts or 220 volts, 20 cycles to 70 cycles, supply for incandescent-lamp, trip-magnet and induction-motor operation; (12) induction motor with back-gear and step-pulley arrangement for driving photographic drum at uniform speed over a great range of speeds; (13) this oscillograph is arranged in two units, weighing but 135 lb.—*Journal A. I. E. E.*, July, 1920.

Electrophysics and Magnetism

High-Frequency Iron Losses.—THOMAS SPOONER.—Data are presented giving the iron losses for 5-mil, 4 per cent silicon steel sheet for a range of frequencies from 5,000 to 50,000 per second. An approximate separation of hysteresis and eddy current losses is made, showing the result of skin effect on these losses. A method of test is described which if desired could be used over a much wider range of frequencies than those indicated. The source of high-frequency supply was a new type of arc oscillator. The probable accuracy of results is discussed.—*Journal A. I. E. E.*, Sept., 1920.

Some Physical Properties of Nickel-Iron Alloys.—L. R. INGERSOLL.—The specific heats, thermal conductivities, thermo-electric properties and specific resistances have been determined for a series of iron-nickel alloys of exceptional purity and definitely known composition.—*Physical Review*, August, 1920.

Electrochemistry and Batteries

Oxygen from the Air as a Depolarisant.—FÉRY.—Attempts to use oxygen from the surrounding air for the depolarization of galvanic cells so far have met with little success. In Switzerland a ZnC cell with natrium chloride is used a good deal for electric clocks, and in a cell suggested by Rosset ammonium cuprate acts as a depolarizing medium, going over into cuprite, which is again rapidly oxidized by the air. The capacity of these cells, however, is rather limited, since their action depends on normal diffusion in the electrolyte. Furthermore, the zinc is usually exposed to corrosion even when no current is flowing. The author has developed a cell where the zinc is entirely protected from oxidation by being placed on the bottom of the jar. The other electrode is a long vertical cylinder of very pure carbon, standing on a small piece of insulation on top of the zinc plate. The electrolyte is ammonium chloride. Owing to the small distance from carbon to zinc the interior resistance of the cell is small. When the cell gives out current, the lower parts of the carbon electrode will be strongly polarized by hydrogen, but since the upper part of the carbon is submerged in a surface layer rich in oxygen, local currents will form in the carbon. The electrolytic action of these currents will even out the concentration differences and depolarize the cell more rapidly than if the oxygen had to pass from the surface down under the influence of ordinary diffusion.—*Archives des Postes*, June, 1920.

Book Review

WINNING THE PUBLIC. By S. M. Kennedy. New York: McGraw-Hill Book Company, Inc. 168 pages, illustrated. Price $2.50.

Taking as his text in effect St. Peter's injunction "Be courteous," Mr. Kennedy, who is vice-president in charge of public relations and business development of the Southern California Edison Company, in this book preaches a sermon under fifteen chapter headings which is sure not to weary his congregation but to interest, enlighten and stimulate it. Courtesy in all the relations of life is the lubricating oil of our complicated modern civilization, and were it to become extinct the machinery of business would creak and groan and ultimately break down. Every utility executive will admit offhand the great importance of conciliatory methods in dealing with the public. Yet how many of those to whom it falls to select the clerks and minor officials with whom alone most customers come into contact, and who to these customers are themselves the company, have realized that for such posts a cheerful bearing and a natural politeness are qualifications quite as essential as a quick grasp of detail or a good head for figures? And how many of the clerks and minor officials who thus meet the company's customers appreciate the truth that incivility, moroseness and indifference are disqualifications for their jobs quite as real as stupidity or slowness? To the utility executive and the under-official alike who have not quite grasped these facts, as well as to the wiser ones who will like to see their own reasoned practice supported by precept, argument and illustration, Mr. Kennedy's book is warmly to be commended. Written in a racy style, embellished with illustrations which have a direct bearing on the points the author makes, and the text enhanced by many apt quotations from poets great and small on the beauty of kindliness, it leaves little to be said on the topic with which it deals. To read it may not change the cherisher of a chronic grouch into a Chesterfield or a pompous humbug into a Sunny Jim, but it will encourage the habitually courteous to persevere in that spirit and it should check the backsliding of those who by imperceptible degrees are losing their first friendly zest. Moreover, it should bring home to any hitherto doubting utility manager the indisputable truth that arrogance and insolence behind the counter can do more harm to public relations in a week than president and directors can undo in a year.

Mr. Kennedy's book will be particularly interesting to public utility executives because its author is an outstanding national figure in the electrical industry who has the confidence both of his public utility associates and of his public. In matters of public relations he has long been considered an authority because of his clear-cut vision of the needs of the central-station customer. His popular paper "The Man in the Street," in which he pictures the influence of the good will of the general public on the central-station company, has been generally recognized as a classic in the literature of commercial relations. This paper, which has been widely published and circulated in public utilities, is included in the book. Some of the other chapters have been published serially in the *Journal of Electricity* and the ELECTRICAL WORLD.

News in Brief

Summary of Market Conditions and of Recent and Approaching Happenings of Importance to the Industry

WITHDRAWAL of the coal-supply priority accorded to public utilities by the Interstate Commerce Commission is threatened owing to the insistence from the Middle West on augmented shipments through the Great Lakes.

ANNOUNCEMENT is made that the Westinghouse Electric & Manufacturing Company has entered both the manufacturing and the operating branches of wireless telegraphy and telephony and has acquired control of the International Radio Telegraph Company. Guy E. Tripp will be chairman and E. M. Herr president of the reorganized company.

PROHIBITION of sign and display lighting in northern and central California has been extended to Nov. 1 by Power Administrator Butler.

APPEARING before the California Railroad Commission, R. H. Ballard, vice-president of the Southern California Edison Company, advocated that rates be fixed so as to provide a return on future financial obligations incurred in the development of the property.

A VIGOROUS protest against frequent shutdowns has been made by the Merchants and Manufacturers' Association of Washington to the Potomac Electric Power Company.

WORK is now proceeding at full blast on the Wilson Dam, which forms an important link in the Muscle Shoals project. Four thousand men are employed on this dam.

NO ACTION will be taken by the Federal Power Commission on any application related to developments on the St. Lawrence or Niagara River until the chief counsel of the commission has reported on its relationship to such projects.

PROPAGANDA against exportation of surplus power from Maine is making its appearance in the New England press, but little popular interest in the subject has yet developed. Explanations of the meaning of the super-power program at the recent Kineo convention of the New England Geographic Division, N. E. L. A., reached the outside public and helped to counteract the efforts of certain local politicians to make capital out of the interconnection idea.

APPLICATIONS to the Federal Power Commission for licenses made by the Crown-Willamette Paper Company of Oregon and the Pit River Paper Company of California have been permitted to be advertised prior to their completion owing to special circumstances affecting the projects.

WHAT effect widespread price slashing may have on the electrical industry is not yet apparent, but quotations and sales will undoubtedly show its influence. A smaller volume of business is reported from all centers except St. Louis. The lumber industry in the Northwest is in better shape. The strike of electricians on the Pacific Coast is over, and labor conditions generally are better. Collections are slowing up. Stocks in most lines are good, and shipments are in larger volume than many jobbers desire. Building construction continues at a low ebb except in the South and on the Pacific Coast.

THE FAN season just past was highly successful, and the left-over stocks are of small dimensions except in the East, where the summer was unusually cool. An even better fan business is confidently expected next year.

NEW ENGLAND electrical jobbers are doing an annual business of $50,000,000 or more, according to information brought out at the Kineo (Me.) convention of the New England Section, N. E. L. A.

REPORTS from jobbers throughout the country indicate that prices in all sections except New England are holding steady. Of forty manufacturers questioned, twenty-nine are optimistic, three pessimistic and the rest non-committal.

THE BUYING movement is making itself felt in lamp sales in all parts of the country. Supplies are holding up well, and there is little likelihood of shortage.

NEED for an informal organization to act as a "research laboratory of ideas" for the entire electrical industry was expressed at the White Sulphur Springs meeting of the Conference Club, which is to try to function along this line.

FIGURES for July issued by the Geological Survey give a total production of electrical energy in the United States of 3,609,319,000 kw.-hr., of which 1,414,177,000 was produced by water power. Production by water power increased 10 per cent and production by fuels 21 per cent in the first seven months of 1920.

ASSERTING that public utility securities are increasing in favor with investors, G. A. Hoyt of William A. Read & Company, investment bankers, holds that preferred stock issues have advantages over mortgage bonds bearing the same interest.

PUBLIC utility financial problems received consideration by the American Investment Bankers' Association at its ninth annual convention, held this week at Boston.

MERCHANDISING problems were discussed at length by the National Association of Electrical Contractors and Dealers, meeting at Baltimore this week.

INTERIOR lighting, metering and the effects of variations of intensity on the eye were the main subjects before the Cleveland meeting of the Illuminating Engineering Society.

THE LARGEST electrical show ever given in New York City opened on Oct. 6.

REFRACTORIES were discussed by the Electric Furnace Association at its Columbus (Ohio) meeting on Wednesday.

EXPANSION of the *N. E. L. A. Bulletin* and discussion of fewer subjects at the annual conventions of the association are favored by the Commercial Section.

IMPORTANT electrometallurgical and electrochemical papers were presented at the Cleveland convention of the American Electrochemical Society.

BRITISH COLUMBIA electrical men from all branches of the industry have launched a co-operative campaign amid much enthusiasm.

COMMERCIAL executives of the Stone & Webster organization held their pioneer convention this week at Boston.

A FREQUENCY changer rated at 15,000 kva. and said to be the largest in the world has been started in the Battle Creek (Mich.) Elm Street plant of the Consumers' Power Company.

PORTLAND, Me., and other cities in the Pine Tree State are planning to repeal daylight saving on Sunday, Oct. 10, instead of waiting until Oct. 31 to re-establish Eastern standard time.

News of the Industry

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields With Announcements and Reports of Association Meetings and Conventions

California Power Restrictions Extended

ALL POWER companies in northern and central California have been advised by Power Administrator Butler of the California Railroad Commission that his order No. 115, prohibiting the use of sign and display lighting except on Saturdays and Sundays, has been extended to Nov. 1. If there should be rainfall sufficient to relieve the power shortage before that date, the order, it is stated, will be promptly canceled. It is with difficulty that certain relief reservoirs can collect enough water to tide them over peak periods, to say nothing of twenty-four-hour operation.

Large Opportunity Seen for Conference Club Idea

IS THE electrical industry "thinking ahead"? Is there now any machinery of organization by which the leading ideas of the different detail organizations can find expression? Can the Conference Club be organized on a different basis to answer these questions? These were some of the problems discussed at a meeting of the Conference Club at White Sulphur Springs, W. Va., Oct. 1 and 2. President L. K. Comstock called the informal meeting together and outlined the steps that have been taken to forward the Conference Club idea since the Cleveland meeting. He stated that several representative jobbers had agreed to advance the plan and that at the Pasadena convention of the National Electric Light Association several of the central-station leaders expressed their personal interest in the idea of forming an organization which could discuss the problems of the whole industry with relation to the public.

Various members present stated their belief in the opportunity to develop the thought that an informal organization could be formed to give a sense of direction to the broad economic, industrial, commercial and social problems that the electrical industry faces in common with other industries. It was repeatedly emphasized that the proposed organization was not a new plan to direct the policies of individual organizations or of individual groups; that is to say, the manufacturers, central stations, jobbers, interstate constructing contractors, local contractors and dealers must all have their individual policies and individual organizations, but there is an opportunity for the leaders of each group to gather at intervals and discuss the relation of all these organizations to national policies.

As one speaker said, there ought to be an opportunity for some group of men in the industry representing all branches to act as a sort of research laboratory of ideas, thinking ahead for the industry as a whole, not discussing matters in terms of this year's business but of the trend ahead for five, ten and twenty years. As a result of the discussion a committee was appointed to work with the executive committee and formulate a plan of organization that would carry out the ideas expressed.

Brooklyn Edison Officials Explain Alleged Irregularities in Coal Orders

THREE indictments under the Lever act have been found by the New York federal grand jury against the Brooklyn Edison Company, Inc. It is charged that the company in July purchased 50,000 tons of coal in excess of its requirements, and it is alleged that this constitutes hoarding in violation of the act. Another of the indictments charges that the company conspired to use preference permits and priority orders for the transportation of coal to tidewater which it did not intend to consume and which was not consumed by it but diverted to other purposes. The third indictment alleges that the company since October, 1919, conspired to pay unfair and excessive prices for coal purchased from the Adelphia Coal Company, Inc.

The following statements by Matthew S. Sloan, president of the Brooklyn Edison Company, Inc., and Walter F. Wells, vice-president and general manager, which were published in the New York City newspapers on Oct. 5, were confirmed to a representative of the ELECTRICAL WORLD by Mr. Sloan. The statement by Mr. Sloan read:

"Our company learns for the first time that it is a crime under the Lever act for a public utility company to have on hand enough coal to take care of its needs. We have no excuses to make, and are in fact proud of our ability under the present difficult coal conditions to secure enough coal to take care of our daily requirements and to build up an adequate reserve to assure the people of Brooklyn of a constant and uninterrupted supply of electricity. .

"Our yearly requirements average 1,500 tons per day. The grand jury was apparently advised that we need only 1,000 tons per day, and acted on that information. We are still in the market for coal, and, despite the indictment, we will continue to purchase coal to keep our bunkers full and build up our reserve to 70,000 tons. We now have approximately 40,000 tons in storage.

"The Edison company has never secured any permit or priority order for the shipment or transportation of coal for, or in connection with, the B. J. Lynch Coal Company, and has not authorized the use of any special permit or priority order for any purpose except to secure coal needed for its own use. It now appears that one of our trusted employees in connivance with the B. J. Lynch Coal Company used the name of the corporation to accomplish the shipment of coal to tidewater. This connivance did not cause any pecuniary loss to the company.

"The company is charged with the purchase of coal from the Adelphia Coal Company from Oct. 22, 1919, at unfair prices. The fact is that no coal has been received from the Adelphia Coal Company except under a contract dated in 1916 and at a price below the market price for coal of a similar grade at the time. Payments by the Edison company to the Adelphia company mentioned in the indictment were for coal delivered and for no other purpose.

"Our company has bought coal at competitive market prices, and we have not paid higher prices for coal than we were forced to pay because of market conditions.

"Our investigation of the charges against this company convinces us that Mr. Wells, our vice-president, is blameless in respect to all matters investigated by the grand jury, and we know of no reason why he should have been mentioned in the indictment."

Walter F. Wells, vice-president and general manager of the Brooklyn Edison Company, in his statement to the newspapers said:

"I know nothing about the transaction with respect to which I am accused, except that in my service as vice-president of the company I know that coal was purchased from the Adelphia company and that the prices were less than similar coal cost us from other sources.

"Neither the company nor myself has had any dealings with the B. J. Lynch company. I was given no hearing by the grand jury on the charges against me, and I welcome the opportunity which a trial of these cases will give me to demonstrate the propriety of my official acts."

Coal Priority Privilege of Public Utilities Threatened

THE priorities accorded to public utilities in the matter of coal supply are again in the balance. In the face of the greatest pressure, the Interstate Commerce Commission is virtually compelled to augment decidedly the amount of coal going up the lakes. The cold weather in the Middle West has had the effect of arousing the people of that section to the point where they no longer will wait for their coal supply. The railroads have found it impossible to meet the lake program. Now they are called upon to furnish a minimum of 2,000 cars daily in addition to those now being used in the distribution of coal in the Middle West. The carriers assert that this is impossible under present conditions.

The commission has given no intimation as to the steps it may take, but it is known that it is considering a modification of the public utility order. Instead of allowing public utilities to have assigned cars, the commission is considering a plan whereby emergency coal will be furnished utilities after the case has been passed upon. There is also under consideration a plan for using all open-top cars for coal movement until the close of navigation on the lakes.

The hearings are behind closed doors. George W. Elliott of the National Committee of Gas and Electric Service, appearing for the public utilities, is understood to have made an extended argument in favor of the modification of the existing service order No. 16.

The hearing was not planned for in advance. The railroads, alarmed by the deficit accumulating on the lake movement, called the operators into conference on Oct. 4. This conference expanded the following day to include most of the interests concerned. On Oct. 6 Division 5 of the commission began executive hearings at which public utilities, coal operators, railroads, steel makers, sand and gravel shippers and others are being heard.

Ballard Advocates New Basis for Electric Rates

APPEARING before the California Railroad Commission at a recent hearing held to fix rates for his company, R. H. Ballard, vice-president of the Southern California Edison Company, advocated a new basis for electric lighting and power rates designed to provide a return, not on the cost of producing the present service, but on the financial obligations that must be incurred in order to carry on the developments that will be required for years to come.

"The inspiration for the financial plan of rate fixing," Mr. Ballard said, "came from public speeches of the presiding commissioner, President Edgerton, who pointed out the imperative need, first, for very large hydro-electric developments in the state and, second, for a system of rate fixing which would not only stabilize rates to consumers but also insure the continuity of reasonable interest and dividends on fair capital to attract still further capital which must now be secured in much larger amounts and at a greater cost than formerly.

"To those who have perhaps inadvertently intimated that the suggested plan is some ruse of the company to fix permanent rates at a time of low earnings, I feel it my duty to draw attention to the fact that the exhibits of the company, now before the commission, include complete statements of earnings for the full years of 1920 and 1921 and, in fact, for five years prior to this period.

"As to the plan itself, it means a large stabilized business on a sound financial basis with the added security of low rates to consumers and a general feeling of co-operation. To the present consumer it means an ample supply of power with good service at rates at least one-third less than those prevailing in Eastern and Middle West communities and with excellent prospects for lower rates from time to time as new developments are completed according to program."

The hearing was adjourned, to be resumed at a later date, when many consuming interests will be heard and the proposed plan discussed.

Underwriters Will Talk to National Electrical Inspectors

THE joint meeting of the Electrical Conference and the National Association of Electrical Inspectors which will be held at the auditorium of the Underwriters' Association of the Middle Department, 316 Walnut Street, Philadelphia, at 10 o'clock next Tuesday morning, will be addressed by A. R. Small and Dana Pierce of the Underwriters' Laboratories, the former speaking on approved devices and the work of the laboratories in general, the latter on some laboratory and inspection problems. Dr. M. G. Lloyd of the Bureau of Standards will talk on "Safety to Life," and W. J. Canada, head of the engineering department of the National Electric Light Association, will explain Rule 15A. Important changes in the National Electrical Code will be announced. In the evening there will be a banquet at the Hotel Adelphia.

Convertible Securities Favored by Investors

UTILITY securities with convertible features have been in active demand recently and some investors are inclined to regard current yields as the maximum. In discussing the present status of such securities O. B. Willcox, vice-president of Bonbright & Company and chairman of the committee on public service securities Investment Bankers' Association, stated to a representative of the ELECTRICAL WORLD that the utilities had found it much easier to sell new issues in this market when they carried some added inducement, especially in the nature of conversion privileges.

"Investors," said Mr. Willcox, "while demanding a high rate of return, are not overlooking the fact that the present rates of interest will not continue indefinitely and the possibility of converting bonds or debentures into preferred stocks yielding 7 to 8 per cent affords a means of continuing a high-yield investment."

Mr. Willcox is also of the opinion that the sales of preferred stock to customers is the best type of financing for the utilities. It has been found to be a very effective and economical means of obtaining funds and customer-stockholders are proving of great value to the electric companies. In addition to this the sale of stock does not increase the debt of the company, but instead builds up a larger equity value back of the mortgage bonds.

Westinghouse Company Enters Wireless Field

THE Westinghouse Electric & Manufacturing Company announced this week its entrance into the manufacturing and the operating branches of wireless telegraphy and telephony. The Westinghouse company's interests in the operating field are the result of its acquisition of the control of the International Radio Telegraph Company. That company, which was founded by R. A. Fessenden, the pioneer investigator in the continuous-wave field, operates and maintains wireless stations on ships and has shore stations at Newport, New London, Brooklyn and Cape May, with others under construction in Maine and Massachusetts. It is perfecting a world-wide service of overseas wireless-telegraph communication and is also active in the development of wireless telephony. The original company (known as International Radio Telegraph Company) has been reorganized to form the International Radio Telegraph Company. The officers are: Guy E. Tripp, chairman; E. M. Herr, president; S. M. Kintner, Calvert Townley and H. P. Davis, vice-presidents, and John V. L. Hogan, manager. All of these are Westinghouse officials except Messrs. Kintner and Hogan, who were president and manager respectively of the older company.

Prior to the war the Westinghouse Electric & Manufacturing Company was not commercially interested in wireless work, but it had devoted a great deal of attention to radio phenomena. During the war, however, it not only carried out extensive researches for the government but also manufactured a large amount of apparatus for military use. A separate factory has now been equipped at East Springfield, Mass., for the manufacture of all types of modern radio apparatus, from the largest transmitting and receiving sets required by transoceanic stations to the small sets used by the amateur. Apparatus will not only be supplied for the well-known land, sea, ship, airplane, military and naval services, but special attention will be paid to the development of new uses, such as for railroads, power companies, mines, lumber camps, ranches and farms, and for inter-works communications of large industries. A staff of research and design engineers has been built up and important fundamental development work is under way.

One of the principal problems of commercial radio-telegraphy is the reduction or elimination of the interference from atmospheric or static electrical disturbances. This phase of the work has been carefully studied by the Westinghouse engineers. The company has exclusive manufacturing and selling rights under the Fessenden patents for the heterodyne method of reception. It also possesses licenses under other important patents, including the Poulsen arc converter system, which is used in long-distance ship and shore stations, notably in the new Lafayette station in France.

New York Electrical Show the Largest Ever Held There

DISPLAYING the development in methods of utilizing electricity in the home, office, store and factory, the thirteenth New York Electrical Show opened on Oct. 6 in the Grand Central Palace. The show occupies three floors of the building, with a total of 151 different exhibitors, making the largest electrical exhibition ever staged in New York.

Of particular interest is the industrial exhibit on the third floor, which is given over to a series of working demonstrations of material-handling equipment, including industrial trucks, conveyors and hoists. Processes of manufacture by electrical apparatus shown in actual operation are furniture making, welding, japanning, heat treating, rivet heating, oil tempering and heating with vacuum furnaces. Complete processes are shown in a bakery, refrigeration plant, battery-charging plant, etc. A special exhibit shows factory lighting, with requirements for safety and highest efficiency.

The remarkable development in household labor-saving devices is indicated by the fact that there are twenty-one different makes of washing machines, eight makes of dishwashers, eleven makes of ironing machines, six iceless refrigerators, three kitchen mixing and beating devices, seventeen vacuum cleaners, twelve ranges and other cooking devices.

The Electrical Show will be open daily from 11 a.m. to 11 p.m. until Oct. 16.

Hydro Projects to Be Advertised Prior to Completion of Applications

THE advertising of the applications for licenses under the water-power act of the Crown-Willamette Paper Company of Oregon and the Pit River Power Company of California, prior to the completion of their respective applications, has been authorized by the Federal Power Commission. In the case of the former company the exception was made because construction is already under way. In the latter case the rule was departed from in order that preliminary construction on a pulp and paper project may begin at an early date. It is desirable to rush the plant to completion in order to relieve the serious paper shortage in California.

Export Association to Meet in New York Oct. 14

FOR the eleventh annual convention of the American Manufacturers' Export Association, which will be held at the Waldorf-Astoria Hotel in New York on Oct. 14, the following program has been prepared:

Morning Session.—Routine business, election of officers and discussions.

Afternoon Session.—Keynote address, "To Obtain Permanent World Trade American Manufacturers Must Now Take a Leading Part Themselves," President W. L. Saunders; address by Dr. R. S. MacElwee, director of the Bureau of Foreign and Domestic Commerce; "Relation of Banking to Export Trade," James S. Alexander, president National Bank of Commerce; address, W. A. Harriman, president American Shipping and Commerce Corporation; "Our International Future," B. C. Forbes, editor *Forbes Magazine;* "Taxation," Otto H. Kuhn, Kuhn, Loeb & Company; "Great Lakes-St. Lawrence Tidewater Project," Julius H. Barnes, United States Wheat Director; "International Chamber of Commerce," John H. Fahey.

Evening, Banquet, 7 o'clock.—Addresses by President W. L. Saunders, Dr. L. S. Rowe, director Pan-American Union; Alfred Reeves, manager National Automobile Chamber of Commerce; Alba B. Johnson, president Railway Business Association, and Dr. Charles Eaton, assistant editor *Leslie's Weekly.*

Investment Bankers See Brighter Outlook for Utility Investments

THAT the public is rapidly coming to appreciate the importance of encouraging the flow of capital into public utilities in order that these may render adequate and expanding service at attractive rates was declared at the ninth annual convention of the Investment Bankers' Association this week in Boston. Special consideration was given to public utilities at a session on Tuesday evening, when O. B. Willcox, chairman of the committee on public service securities, presented a comprehensive report summarizing the trend of public opinion in relation to utility problems and emphasizing the better outlook resulting from popular enlightenment and sound regulation. The demand of the public for improved and expanded service, involving large expenditures of new capital, has brought with it, the report held, due appreciation of the function of credit in public service. The general attitude of the press reflects the growing opinion that the self-interest of the public served demands the payment of rates that will both attract and protect capital, assure a fair return and provide good credit. The report commended the federal water-power legislation, electrical expansion and super-power systems and advocated the local distribution of utility securities, coupled with continuing interest in utility financing by investment bankers.

Declaring that the practice of local utility security distribution is encouraged by bankers, the report went on to say:

> The appreciation by the public and the regulators of the necessity of credit for adequate public service and the examples of the difficulties consequent on insufficient equity financing should promote the adoption of broader schemes for utility financing with such balance of bonds and stocks as compared with property values and earnings as will permit the marketing of stocks sufficient in amount adequately to protect and balance the increasing amounts of bonds issued. There should be more owners and fewer c editors. The ideal utility financial structure should admit of the sale of common stocks, which of course is only possible if those stocks, unsecured by lien or preference, are protected by property values and by earnings sufficient to represent a reasonable business risk, with some expectation of more than ordinary profit.
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> The principle of the non-par-value stock is now better understood, and the use of such shares is increasing and growing in public favor. It is illogical that a share of stock should be used both as a measure of value and as an evidence of title. The value constantly changes. There is no theory on which all shares of all companies can be made to sell at $100, or any other so-called par value; and if sold at par the shares may appreciate or depreciate in value, and the next issue by the same corporation may have to be sold at a higher or lower rate. On the other hand, the share as an evidence of title always represents an undivided interest in property. Non-par-value shares seem best to meet the requirements for which shares of stock were invented.

Carl D. Jackson, president Wisconsin Railroad Commission, addressed the convention upon the public utility situation, pointing out the growing recognition by the public of fundamental economic considerations bearing upon utility administration and rate making, and touching upon the efforts of regulatory bodies to meet the changed conditions of today by recognizing the necessity of adequate returns to attract capital into the field of public service. The primary importance of service in establishing and maintaining public confidence and approval was set forth. The speaker declared that the time seems near when the public will again have recourse to safe and stable public utility securities for investment. He outlined the financial needs of the utilities in the coming years and urged investment bankers to establish close and permanent relations with utility financing and to co-operate with the regulating commissions in seeking sound and approved methods of meeting the financial needs of such properties. Preferential treatment in the public interest should be accorded utilities by the banking interests as a quasi-public duty. In general, the speaker said, the utilities are weathering the storms of the past few years and are on the road to more prosperous conditions.

A resolution was passed recognizing the necessity for public utility expansion, fuel conservation and electric railway rehabilitation and offering the co-operation of the association to the owners and operators of utilities and regulating officials in laying before the public full information respecting the vital importance of the prompt and continuing expansion of all kinds of utility service. The resolution favored such financial regulation as will predispose the investing public to provide the necessary funds by purchasing sound public utility securities. Copies of this resolution are to be sent to the governors and the regulating authorities of the several states.

Furnace Men Discuss Refractories

MORE than a hundred electric furnace operators and manufacturers of electric furnace products met in Columbus, Ohio, on Wednesday of this week when the Electric Furnace Association assembled to discuss a program consisting of six papers dealing with the refractories required in electric furnaces. R. M. Stull of Columbus emphasized the need of refractories which withstand higher temperatures than those now used in electric furnaces. He suggested some new refractory compounds, but said that to burn them would require electric kilns operating at about 2,200 deg. C., and he did not think that any such kilns had been developed.

Stone & Webster Commercial Agents Convene

COMMERCIAL agents of properties managed by Stone & Webster, Boston, met for the first time in convention this week, sessions being held on Tuesday and Wednesday at the headquarters offices. The program included the following papers or addresses: "Selling Securities of the Local Company Through Its Own Commercial Department," by C. W. Kellogg; "When Are Extensions Profitable?" by G. E. Quinan; "Merchandising Methods," by H. J. Pettengill, Jr.; "The Plot in Newspaper Advertising," by H. A. Lemmon; "Window Dressing and Store Arrangement," by J. T. G. Nichols. A luncheon was scheduled at the Exchange Club, Boston, Tuesday noon, with addresses by E. S. Webster, H. H. Hunt, Russell Robb, Henry G. Bradlee, H. T. Edgar and F. J. Whiting. About fifty commercial agents representing all parts of the country were expected.

Electrochemists Hear About Self-Baking Continuous Electrode

AT THE thirty-eighth general meeting of the American Electrochemical Society, held in Cleveland on Sept. 30, Oct. 1 and 2, there were two technical sessions for the reading and discussion of papers, one being devoted particularly to electrometallurgy and the other to electrochemistry. Among the important electrometallurgical papers were those of M. R. Wolfe and V. de Wysocki on "Heat Losses Through Electrodes of a Six-Ton Heroult Furnace"; M. L. Hartman, A. P. Sullivan and D. E. Allen on "Physical Characteristics of Specialized Refractories—Part III, Electrical Resistivity at High Temperatures"; J. W. Richards on "The Söderberg Electrode: First American Installation," and J. Kelleher on "Some Phenomena Observed in Electric Furnace Arcs." The Söderberg continuous self-baking electrode is an innovation in this country, the first installation being at Anniston, Ala., in an 1,800-kw., three-phase furnace making ferromanganese. The electrodes are 32 in. (80 cm.) in diameter, and the operation of the furnace is continuous as far as electrodes are concerned. The electrochemical papers related primarily to corrosion and the electrodeposition of metals and alloys.

The feature of the convention was the afternoon visit to the Nela Park Laboratories of the General Electric Company. A lecture on industrial lighting was given by Ward Harrison, chairman of the reciprocal relations committee of the Illuminating Engineering Society. This was illustrated by a demonstration of modern industrial lighting. Industrial plants visited included the United States Copper Products Company, where electric furnaces are in use for copper, brass and bronze melting; the National Castings Company, where the Heroult furnace is used for making castings; the Western Reserve Chemical Company, manufacturer of organic chemicals by electrolytic methods; the Ohio Chemical Company, manufacturer of electrolytic gases, and the Guide Motor Lamp Company, electroplating with rotating electrodes.

At a brief business session it was announced that the recent referendum on a resolution approving legislation to make the metric system the exclusive legal system of weights and measures in the United States resulted in a vote of 483 in favor to 107 against, out of a total membership of about 2,000. The board of directors selected Atlantic City as the place for the next meeting in the spring of 1921.

Numerous Rulings Made by Chief Counsel of Federal Power Commission

THE relationship of the Federal Power Commission and the International Joint Commission to power development on the St. Lawrence and Niagara Rivers is to be the subject of a special report by the chief counsel of the Federal Power Commission. Pending this report and its approval no action is to be taken on any application affecting the St. Lawrence or Niagara River.

The Federal Power Commission also has decided that no hearing is to be held prior to the termination of the period of advertisement. Hearings will be arranged, however, within a week or ten days after the expiration of that period if a quorum of the commission can be in attendance and if the necessary information is available.

The chief counsel has been requested by the commission to report on the possible effect of issuing a preliminary permit upon the status of certain lands now within a power reserve but to which the Pit River Power Company claims ownership through purchase from California.

In a report to the commission the chief counsel holds that the authority of the commission does not extend to allotted Indian lands. The report was made in connection with the application of the Washington Power Company for right-of-way that is required by a power transmission line.

The Pacific Gas & Electric Company and the Mount Shasta Power Company applied to the Forest Service for easements for a transmission line under authority of the act of March 4, 1911. The chief counsel of the Federal Power Commission, however, held that the water-power act repeals the portion of the previous act providing for the issuance of such a permit. He held that application must be made to the Federal Power Commission.

Interior Lighting, Metering and Effects on Vision Discussed by I. E. S.

THE application of light to residential, commercial and industrial interiors, means of measurement and the effect on the eye were the subjects that had most consideration in the twenty papers presented at the fourteenth annual convention of the Illuminating Engineering Society at Cleveland, Ohio, held on Monday to Thursday of this week. One evening session held at Nela Park was preceded by a dinner tendered to the members and guests by the National Lamp Works of the General Electric Company.

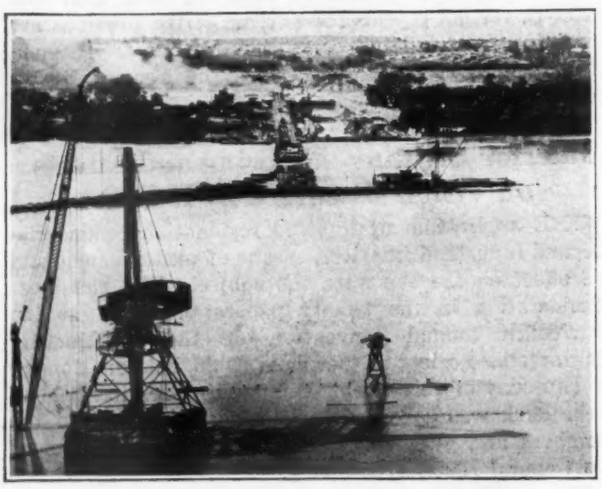
The excellence of the papers presented at the convention was the subject of much favorable comment, but it was generally felt by the members present that the program was too full to permit of its having the consideration and discussion it deserved. Practical plans, including the necessary financing for broadening the scope and increasing the usefulness of the society, were announced in the address of the retiring president, S. E. Doane, who has made arrangements for the society to collect, compile and publish illuminating engineering data for the entire industry. It is intended

that the society shall sell reprints to manufacturers and others at a price which will cover the overhead expense necessary to take care of the program.

Ten of the papers presented at the convention were on subjects pertaining to interior illumination, and four of these record the efforts of central stations to raise the standard of lighting on their customers' premises. Other subjects discussed under this general heading included "Improved Methods for Illuminating Motion-Picture Theaters," by L. A. Jones; "The Lighting of Shoe Factories," by A. L. Powell and J. H. Kurlander; "Recent Applications of Color in Lighting," by A. D. Curtis and J. L. Stair, and "Some Mechanically Difficult Applications of Industrial Lighting," by Samuel G. Hibben. The papers on metering included one by Davis Tuck on the construction of a small portable light meter capable of making accurate measurements. How to make and use a simple portable reflectometer of the absolute type was described by A. H. Taylor. A procedure was worked out by C. H. Sharp and W. F. Little whereby the reflection factor may be measured by an absolute method for any surface whether matte or glossy. A comprehensive paper on the important effects on the eye of variations of intensity was prepared by C. E. Ferree and Gertrude Rand. They found that increased intensities when not accompanied by harmful glare produced a gain in acuity, speed of discrimination, speed of adjustment and in the power to sustain clear seeing.

The annual losses sustained as the result of accidents attributable to poor lighting were estimated by R. E. Simpson to amount to $300,000,000, or more than the present industrial lighting bill of the country. Before the close of the convention the new president, General G. H. Harries, was inducted into office.

Work Again Under Way at Muscle Shoals



AFTER the most unfavorable season ever recorded on the Tennessee River, work has started at full blast on the Wilson Dam at Muscle Shoals. Four thousand men are engaged on the work, which calls for a monthly expenditure of $700,000. Gen. Lansing H. Beach, the chief of engineers, recently visited the Wilson Dam and reports that the power-house cofferdam has been pumped out and that everything looks favorable for rapid progress on the project.

The illustration gives a view from the south or power-house end of the dam, showing the work in a flooded condition on Aug. 19, 1920. This is a very unusual condition for this season of the year on the Tennessee River.

Merchandising Electrical Appliances Has Attention of Contractor-Dealers

AT AN unusually well-attended convention of the National Association of Electrical Contractors and Dealers held this week at the Southern Hotel, Baltimore, Md., special attention was given to the subject of merchandising of electrical appliances and fixtures. A report was presented to the executive committee and approved relating to resale merchandise. While no attempt was made to define the margin of profit, still it was agreed that proper accounting methods would disclose a cost of doing business which would more than offset present discounts and still leave an attractive profit.

At the opening session Thomas A. Whelan, president Fidelity & Deposit Company of Maryland, presented a vivid picture of a nation-wide canvass made a month ago. Mr. Whelan indicated that the present situation is not one to cause pessimism, but he said that unsual care should be exercised by all business men. He showed that there was no shortage of raw materials and also pointed out that the buying public was inclined to forego luxuries. Legitimate business organizations, he asserted, would have no difficulty in obtaining sufficient funds from the banks to help them carry on their business and maintain creditable stocks.

The methods employed by the Society for Electrical Development to help the contractor-dealer in the solution of his problems, especially those pertaining to merchandising, were explained by J. M. Wakeman, general manager of the society.

J. L. Wolf, secretary of the Lighting Fixture Dealers' Society of America, gave some interesting data relating to the proper handling of fixture sales, which brought forth considerable discussion. The opportunity for the contractor to engage in the sale of industrial electrical material was interestingly brought out by J. A. Clark of the Westinghouse Electric & Manufacturing Company, in a paper entitled "Sale of Motors for Industrial Uses." This was followed by an instructive paper by A. L. Abbott of the Electric Construction Company of Minneapolis on "Managing an Electrical Contracting Business."

The remaining hours of the Thursday morning session were given over to a three-fold discussion of what the three national associations, the National Electric Light Association, Supply Jobbers and Associated Manufacturers, are doing to help the electrical contractor-dealer improve retail distribution.

Friday morning was given over to theories of merchandising, with the following program: "A Two-Billion Industry," by H. B. Kirkland; "Harmonizing the Industry," by Samuel A. Chase; "Scientific Merchandising," by W. L. Goodwin, and "Advertising for the Contractor-Dealer," by William A. Thompson, bureau of advertising, American Newspaper Publishers' Association.

An elaborate demonstration of illumination in its industrial application was made Friday afternoon by Ward Harrison of the National Lamp Works of the General Electric Company, Cleveland. In conjunction with this demonstration a paper by R. W. Shenton, "A New Era in Lighting," and one by P. B. Zimmerman, "The Industrial Lighting Market and the Contractor's Part in Selling It," were presented. The local committee had laid out an extensive entertainment program.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Financing the Kerckhoff Project.—The San Joaquin Light & Power Corporation has applied to the California Railroad Commission for authority to issue $2,625,000 of bonds to cover expenditure incurred in constructing the Kerckhoff power project on the San Joaquin River, including the transmission line and necessary substation.

Long-Distance Telephony in Japan.—Work on underground long-distance telephone lines from Tokyo to Osaka and between Tokyo and Hokkaido is to be begun early next year, though it is not expected to be completed for two years. There is already one underground telephone line in service in Japan, that between Osaka and Kobe, a distance of 25 miles.

An Old-Time Dam Disappears.—The Detroit Edison Company recently finished building on the Huron River, near Ann Arbor, Mich., a modern reinforced-concrete spillway to take the place of a timber and stone-filled dam that dated back eighty-eight years, having been built in 1832. This ancient structure had endured to play its small part in hydro-electric development, undreamt of in its early days, but an unusually high flood in 1918 finally put it out of business.

Hydro-electric Development in New Zealand.—The development of the water powers of New Zealand undertaken by the government and by locally elected power boards is making progress. One of the power boards has engaged Hays & Vickerman of Wellington, New Zealand, to proceed at once to design and construct a 12,000-kw. hydro-electric plant at Southland. This project involves the building of 48 miles of double and 48 miles of single 66,000-volt transmission line, some outdoor substations and a primary network involving about 2,000 miles of line.

The Argentine-Brazilian Waterfalls.—The falls of the River Iguazú, on the border of Brazil and Argentina, 800 miles from Buenos Aires, are, according to the secretary of the British legation at that capital, under investigation by the Argentine government with the view of their exploitation for electrical power, and the Brazilian authorities have been asked to co-operate in the work. There are 275 cascades in this portion of the river and one of them has a sheer drop of 213 ft. American engineers are said to have pronounced their development technically feasible, but the financial and engineering factors involved are so formidable that there is no early prospect of the project being undertaken either by public or private enterprise.

Electrical Growth in Kansas City.—Among the cities where rapid industrial growth has made large extensions to the central station necessary is Kansas City, Mo., where it is announced that the Kansas City Power & Light Company is planning to expend $4,500,000 in the coming year. The plans include drilling a second condenser well and building an addition to permit the installation of a 20,000-kw. or 30,000-kw. generator with all auxiliaries, the cost being put at $2,500,000. The remaining $2,000,000 is required for extensions of the transmission system.

Building a Stack in Record-Breaking Time.—A sixth stack has been added to the Connors Creek plant of the Detroit Edison Company in what is held to be remarkable if not unprecedented time. Work on the steel construction began on June 24 and was finished on Aug. 3, twenty days ahead of the scheduled date. Brickwork in the lining of the stack started on Aug. 9 and was completed on Aug. 21, twelve working days, including two Saturdays when work went on for part of the day only. It is estimated that 74,000 bricks were used, an average of 6,700 daily, or 1,340 per man per day. The stack is 240 ft. in height.

Rate Increases Continue.—An increase of ¼ cent to ½ cent per kilowatt-hour in wholesale power rates has been granted to the People's Power Company in Rock Island, Moline and seven other Illinois places served by it. The Nassau Light & Power Company, operating in Glen Cove and Locust Valley, N. Y., and also the Glen Cove Light & Power Company, will be allowed to charge 12 cents a kilowatt-hour for general lighting after Oct. 20, an increase of 3 cents. An advance in light and power rates has been allowed to the Consolidated Light, Heat & Power Company of Huntington, W. Va. Kaysville, Utah, which purchases energy from the Utah Power & Light Company, has increased its rates to citizens from 8 cents to 12 cents a kilowatt-hour, with a minimum charge of $1 instead of 50 cents.

Loud-Speaking Device Heard on Outgoing Ship Without Receiving Apparatus.—When the *Imperator* sailed from New York for Europe a week or two ago the passengers had an exemplification of the power of loud-speaking telephone devices as developed by the Western Electric Company. A call "paging" two of those on board was heard distinctly all over the ship, as were the farewell messages and music that followed it. It was explained that a loud-speaking transmitter had been set up in a tenth-story office window near the waterfront in order to make the experiment, which, in spite of the adverse conditions occasioned by the noise of the city streets, was entirely successful. Still more remarkable results are prophesied. This was the first time that an outgoing ship had been communicated with in this way.

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month.

Missouri River Electrical Distributers. The annual meeting of this body, which will be in St. Louis, is scheduled for Oct. 14 and 15.

Chicago Section, American Welding Society.—This section will meet on Tuesday, Oct. 12. It has issued a booklet, the title of which is "Keep the Guess Work Out of Welding."

Cleveland District Section, A. I. and S. E. E.—On Monday next, Oct. 11, this section will listen to a paper on "Troubles of the Electrical Operating Man," by A. W. Mohrman, Trumbull Steel Company, Warren, Ohio.

Yesterday's A. I. E. E. Meetings—The Providence (R. I.) Engineering Society Section and the Philadelphia Section of the A. I. E. E. met yesterday, automatic substations being considered by the former society and secondary distribution and demand measurements by the latter.

Commonwealth Edison Section, N. E. L. A.—The final meeting of this section for the 1919-1920 season was held on Sept. 12, when the members were addressed by Samuel Insull. The officers elected for the coming season were: Chairman William A. Durgin; vice-chairman, Allen Gatef; treasurer, William A. Fox; secretary, Frank Ashton.

Philadelphia Engineering Meetings.—On Tuesday, Oct. 12, Dr. George K. Burgess will make a luncheon address before the Engineers' Club of Philadelphia on "The Bureau of Standards and Its Engineering Contracts." On Thursday, Oct. 14, the American Society of Heating and Ventilating Engineers will listen to a "Résumé of the Work of the Research Bureau" by Dr. John R. Allen. On Wednesday, Oct. 13, the local section of the American Association of Engineers and on Friday, Oct. 15, that of the Illuminating Engineering Society meet.

Coming Meetings of Electrical and Other Technical Societies

American Electric Railway Association—Atlantic City, N. J., Oct. 11-15.
National Association of Electrical Inspectors—Philadelphia, Pa., Oct. 12-13.
British Columbia Association of Electrical Contractors and Dealers—Vancouver, B. C., Oct. 19.
International Association of Municipal Electricians—New Orleans, Oct. 19-22.
Association of Railway Electrical Engineers—Chicago, Oct. 28-31.
Electrical Supply Jobbers' Association—Cleveland, date in November to be fixed.
American Engineering Council—Washington, D. C., Nov. 18-20. (For program see issue of Sept. 25, page 651.)
Electric Power Club—Hot Springs, Va., Nov. 15-18.
Southeastern Geographic Division, N. E. L. A.—Miami, Fla. Nov. 17-19.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities.

Intelligible Accounts Insisted On.—The Washington Public Service Commission, which claims never to have allowed a rate that would yield a return on watered stock and inflated bond issues, has refused to increase the rates of a water company which had kept its accounts so badly that it was impossible to determine its actual net income.

Assessing Cost of Synchronous Motor-Generator Set.—An electric generating company, the Nevada Public Service Commission recently decided, should furnish free of cost electric energy for a synchronous motor-generator set of a distributing company which is a factor in producing voltage regulation in the vicinity, where complaints had been filed regarding unsatisfactory voltage regulation.

Violation of Commission's Order by Town Official.—A member of the Town Council of Ault, Col., having had his own premises connected with the municipal system despite the commission's order that no new consumers were to be served, and the Farmers' Electric & Power Company having sought to have the town's authorities published for contempt, the Public Utilities Commission found no evidence that these authorities had sanctioned the act of the individual referred to and, censuring the company for failing to follow up its charges, dismissed the complaint.

Co-operation on the Part of Customers of Small Utility Commended.—In granting increased rates to the Bandon Power Company the Oregon Public Service Commission commended the "general spirt of co-operation upon the part of the citizens and residents of Bandon to the end that they may have continued service without undue expense or making it prohibitive to the utility." It was generally agreed, the commission said, by business men and city officials present at the hearing that the power company was cautious in its expenditures and was operating under as economical a basis as possible. A further effort to reduce the peak load was recommended by the commission.

Excessive and Reasonable Rates.—Where increased rates yielding about 5 per cent greater gross revenue will enable an electric utility to meet estimated increased operating expenses, providing 7 per cent for return and 5 per cent for depreciation, proposed increased rates yielding from 16 to 22 per cent additional gross revenue are excessive, the Missouri Public Service Commission declared in passing on applications for increased rates made by three companies under the same ownership in that state. The controlling electric utility, having an estimated property value of $328,000 and serving places of 11,000, 2,300 and 1,300 population, was permitted to charge maximum basic rates of 11½ cents per kilowatt-hour for the community containing the plant and 12½ cents and 13½ cents respectively for the communities served by transmission lines.

Regulation of Non-Continuous Service.—The Missouri Public Service Commission fixed the following rules and rates for an electric utility having property valued at $9,000 and rendering non-continuous service: Service to begin fifteen minutes prior and on cloudy days one hour prior to sunset and to last until 11 p.m. and on Saturday until midnight; monthly rates, 15 cents per kilowatt-hour with a service charge of 50 cents, subject to a minimum charge of $1; street lighting, 60-watt lamps, $1.75; 500-watt lamps, $10; water-pumping service, 70 cents an hour.

Special Rates — Large Consumers with Several Plants.—Any special service which a power company renders to mining or other companies should be paid for as a separate transaction, according to a decision of the Nevada Public Service Commission in a rate complaint made by the Esmeralda Power Company against the Nevada-California Power Company, and should not be included in the terms of a rate schedule. The commission also affirmed that a company has the right to include the meter readings at different locations as one service so as to be entitled to lower rates for greater consumption where the different plants are operated as component parts of one business, but not otherwise.

Changing from Direct to Alternating Current.—Having heard a complaint against the announced intention of the Martinsville Gas & Electric Company to change its electric system from direct to alternating current, the Indiana Public Service Commission decided that, although it had the power to order direct-current service continued, it would not do so in this case as it would burden the consumers with excessive rates. The commission declared that it had no power to award compensation to owners of direct-current motors in case the system is changed to alternating current, but it made suggestions to the effect that the company bear two-thirds of the cost, furnish its consumers with alternating-current appliances at cost and help them in disposing of their old equipment. The company was ordered to continue direct-current service for a reasonable time. The question whether a change from direct current to alternating current should be permitted, the commission said, should be decided upon the broad basis of the efficiency and economy of the system as a whole and the quality of the service that may be rendered with or without the proposed change.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies.

Power to Fix Charge Retained by State.—Power to fix the fare to be received by a street railway or its proprietary companies having been retained by the state in its public utilities act, this power, the Supreme Court of Utah has declared, in Murray City vs. Utah Light & Traction Company, can be exercised whenever the necessity requires despite city ordinances, and such action does not impair the obligation of a contract. (191 Pac. 421.)*

Fraudulent Transfer.—In Creighton Gas, Electric Light & Power Company vs. Jamison, the Supreme Court of Nebraska declared it to be a fraud which no court will permit to allow officers of a corporation who owned all its stock, after having agreed with a third party to transfer the property of the corporation to him, to transfer in the name of the company such property to one of their number between the time of the signing of the contract and the actual transfer of the property. (178 N. W. 830.)

Courts Will Not Interfere with Corporate Management in Absence of Fraud.—In an action brought by the Western Union Telegraph Company against the Public Service Commission of New York for the Second District, the Supreme Court of New York declared that the powers of those intrusted with corporate management are largely discretionary and that the courts will not interfere unless the powers have been illegally and unconscientiously exercised, or unless it be made to appear that the acts were fraudulent or collusive and destructive of the rights of the stockholders. (183 N. Y. S. 659.)

Emergency Rate-Fixing Powers of Commission. — Under the Wisconsin statutes the Supreme Court of that state held, in City of La Crosse vs. Railroad Commission, that the undertaking of an inquest such as is required to establish permanent rates is not necessary to the determination of the existence of an emergency making increased rates essential, the commission having under such conditions the power to act in a summary manner. In such a case its action is not to be overruled unless it appears that it has exceeded its powers or that its acts impose unreasonable or unjustly discriminatory burdens upon the people or the utility. (178 N. W. 867.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

M. C. Osborn, formerly sales manager of the Washington Water Power Company, Spokane, Wash., and past-president of the Northwest Electric Light & Power Association, has associated himself with the Gillespie Eden Corporation as utility representative. Mr. Osborn will be connected with the main office of the company in New York.

Olin H. Landreth has resigned as chief engineer of the Eastern Potash Corporation, New Brunswick, N. J., and opened a consulting engineering office at 156 Fifth Avenue, New York City. He will specialize in power developments, industrial engineering, hydraulic engineering and valuation work. Mr. Landreth will devote a part of his time to the Eastern Potash Corporation as consulting engineer.

C. A. Moore, superintendent of the electrical department of the Cambria Steel Company at Johnstown, Pa., has resigned to become superintendent of the new power plant of the Berwind-White Coal Company at Windber. Mr. Moore entered the employ of the Cambria Steel Company in 1902 and was superintendent of the Franklin plant at Westmont, Pa., until 1917, when he became electrical department superintendent. In his new post he will report to C. W. Parkhurst, now consulting engineer for the Berwind-White Coal Company.

Walter E. Miller has resigned from the staff of the Railroad Commission of Wisconsin, terminating a connection therewith of nearly fourteen years, inclusive of occasional private engagements, to engage in private practice as a consulting engineer. His practice will include investigations and studies of steam and electric railway and public utility problems, especially the valuations of such properties, rate making therefor, reports on efficiency of operation, designing, estimating and supervising construction of new properties and improvements of existing plants. For the present his office will be 413-416 Pioneer Block, Madison, Wis.

F. J. Sill, superintendent of distribution and commercial manager of the companies operated as the New England Power Company system, has resigned. Mr. Sill has been prominent in the development of the New England system during the past ten years and is widely known in central-station and industrial circles. He came to the old Connecticut River Transmission Company from the Brooklyn Rapid Transit Company in 1910, originally having charge of relay and meter work. In March, 1912, Mr. Sill was made superintendent of distribution, and in January, 1919, was placed in charge of the commercial and sales work of the system. At the time of his resignation he also supervised the management of the Fall Mountain Electric Light Company, Bellows Falls, Vt., and of the Gardner (Mass.) Electric Light Company. During the summer Mr. Sill will make his headquarters at 109 South Street, Westboro, Mass., and in the fall expects to re-enter the field of active practice.

Men of the Industry

Changes in Personnel and Position—Biographical Notes

William C. Lounsbury, who has been elected president of the new Great Lakes Section of the N. E. L. A., is general manager of the Superior (Wis.) Water, Light & Power Company, with which he has been identified for the past fifteen years. Mr. Lounsbury was graduated from the Massachusetts Institute of Technology in 1904 and after spending a few years in practical work in Worcester, Mass ; Washington, D. C., and New York City, he was placed in charge of construction work of the Superior Water, Light & Power Company. In 1912 he was made general superintendent, which position he held until he was appointed general manager in 1918. Mr. Lounsbury has been active in association work in the State of Wisconsin and served as vice-president and president of the Wisconsin Electrical Association.

W. C. LOUNSBURY

Prof. Dugald C. Jackson, consulting engineer, Boston, Mass., has been appointed chairman of the standards committee of the American Institute of Electrical Engineers, succeeding L. T. Robinson. In 1907 Professor Jackson was put in charge of the department of electrical engineering of the Massachusetts Institute of Technology. Early in 1918 he was commissioned major in the Engineers' Reserve Corps, and was ordered to France. Professor Jackson is a past-president of the American Institute of Electrical Engineers and of the Society for the Promotion of Engineering Education and a member of other national associations. He has contributed largely to the literature of electrical engineering.

Byron H. Hurd, formerly assistant secretary of the California-Oregon Power Company, has been made acting secretary of that company to succeed J. C. Thompson, who was appointed manager of the Klamath division.

G. A. Sawin, service engineer with the Public Service Electric Company, Newark, N. J., has resigned to become assistant to the manager of the supply department of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. In his new position he will take care of the public utility work of the supply department. Mr. Sawin was graduated from Harvard University in 1901 with the degree of bachelor of science in electrical engineering. He then entered the meter engineering department of the General Electric Company at Lynn, Mass., where he remained seven years, engaged chiefly in the design of alternating-current watt-hour meters. About twelve years ago Mr. Sawin joined the Public Service Electric Company as meter engineer, having charge of the meter department of the company. Later he assumed illumination duties and became meter and illuminating engineer. In his latest position as service engineer his duties consisted of investigating and following every application for power from the time it was made until the customer was connected to the lines. Mr. Sawin is a member of the American Institute of Electrical Engineers, the National Electric Light Association and the Illuminating Engineering Society. He served on the N. E. L. A. meter committee 1909-1912, inclusive, being chairman of the committee during the last three years. He was a member of the committee on metering and service methods of the Association of Edison Illuminating Companies, 1913-1920. He also served on the board of managers for the Illuminating Engineering Society, New York Section, 1920.

Obituary

Lucilius A. Emery, for five years Chief Justice of the Supreme Court of Maine, and a foremost authority upon the legal phases of water-power development, died recently at Hancock Point, at the age of eighty years. Judge Emery contributed a valuable report on the "Legal Phase of the Water-Power Investigation" to the account of the special investigation of water-power resources which was published late in 1918 by the Maine Public Utilities Commission.

S. C. Green, founder and owner of the Green Electric Company of Dallas, Tex., died at his home in Dallas recently. Mr. Green was one of the best known electrical engineers in the Southwest and designed and built many of the electric light plants throughout Texas and Oklahoma. The plants at Antlers, Okla., and Ranger, Tex., are two of the latest.

Trade and Market Conditions

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies—Notes on Industrial Activities and Business Methods

Uniform Guarantee Adopted by Washing-Machine Manufacturers

THE American Washing-Machine Manufacturers' Association adopted at its recent meeting a uniform guarantee for the use of all its members. In addition to a one-year guarantee against defects in workmanship or material, provision is made for the free replacement of parts proving defective during the life of the guarantee. Ordinary wear, accident or misuse are expressly excepted. Replacements of defective parts will be made f.o.b. factory, but no local service or repair charges will be allowed. The guarantee does not apply if machines are used for any other than for private-family washings.

Fan Manufacturers Optimistic Over Prospects for 1921

IN SPITE of unfavorable weather causing poor fan sales in some sections of the country, notably the East, manufacturers almost unanimously agree that the season just passed has been on the whole a very successful one. A survey of the fan stocks left over in the hands of dealers and jobbers throughout the country reveals virtually no surplus in the South, medium stocks in the Middle West and a small supply in the Far West.

San Francisco reports that the number of fans left over on the West Coast is comparatively small, as the past season has been an excellent one there. Unusually hot weather in the interior valleys was an important factor. In the Intermountain section sales were very satisfactory. Few fans are left on hand in that territory. St. Louis reports that comparatively small stocks are held over by jobbers and dealers. Orders for ceiling fans were still being received through September at an increase over the season's contract prices. In the Chicago district the number of fans to be carried over is still undetermined as deferred summer weather caused unusual selling through last month. The outlook for clean shelves is now better than a few weeks ago. In Atlanta territory jobbers state that this has been one of the biggest fan years on record. The chief demand was for oscillating desk fans, but there is no surplus stock of any type, it is said. In the East, on the other hand, sales have been disappointing. In the New York district unseasonable weather held demand to a minimum and large stocks have accumulated. Ceiling fans present a notable exception to the general light demand. Cut rate sales have been few, however. In New England the volume of business has also been comparatively poor and substantial stocks remain unsold. A leading jobber will carry over about $7,500 to $10,000 worth of fans.

Manufacturers are extremely optimistic over prospects for next year. One of the leading manufacturers is planning to meet a 25 per cent increase over the 1920 demand and producers generally expect to increase production. The basis of this optimism is said to be the growing use of fans in households which has nowhere near reached its peak. Furthermore, the spread of moving-picture houses and also the number of soda fountains and restaurants which have supplanted vacated saloons throughout the country are expected to provide a large market. Plans are on foot to increase sales further by promoting the use of fans in cold as well as in warm weather for heating purposes.

The outlook for supplying next year's demand is not entirely favorable. Considerable difficulty has been experienced in getting raw material, and though this condition has improved, it will not be 100 per cent on next year's output, according to leading manufacturers. Transportation congestion is another unfavorable factor right now. The use of personal tracers on cars and express shipments is being resorted to in many cases. Manufacturers think it will be long before this situation returns to normal. Reports on labor differ. Several producers are finding a smaller turnover, a larger available supply of labor and a bigger output per man, while others are not meeting such favorable conditions.

Stocks of fans in the hands of manufacturers vary. One representative producer has 20 per cent of this season's output on hand, but many others are absolutely cleaned out. Ceiling fans are the one type of which no producer has a supply. Great emphasis is laid by manufacturers on the need of anticipating orders for 1921. One of the main factors adversely affecting fan sales in the East this year is said to have been the delivery of many orders too late to supply the demand. Fan manufacturers are fearful of similar congestion on deliveries next spring. To avoid this condition, price schedules in many cases are being prepared a month earlier than usual, so that fans normally ordered in January can be contracted for this November or December.

The general price tendency on fans seems to point to higher quotations. Present raw material supplies were ordered last winter when prices were at their peak, so that no reductions can be looked for during 1921 at least, it is generally stated. Early in September fan prices were advanced for 1920 contracts, pending the preparation of 1921 contracts. So far as can be learned no business has been placed for 1921 as yet. One manufacturer had decided to raise prices Oct. 1, but it has not been possible to find out whether or not this higher schedule will go into effect.

Trend of Prices Held Dependent Upon Raw Material

CONSIDERABLE speculation is manifest as to the effect that price cuts in many lines may have upon trade and prices in the electrical industry. As yet it seems there has been no decided reaction. Reports received from jobbers throughout the country indicate that prices in all sections are holding steady except in the East. In the latter district easier quotations are current in several lines as the result of overstocking. The general attitude of the trade just now seems to be one of marking time. On the Pacific Coast, however, electrical jobbers express fear of the effect that general price slashing may have upon business.

In the East the view is expressed in several quarters that conservatism in buying may rule for the next few months. Further than that, while many manufacturers and jobbers will not venture predictions, a very large number seem to feel optimistic over the outlook for 1921. The basis for this is held to be the undersold condition of the electrical market in many lines such as steel material, porcelain, etc., and the existing belief that next spring will see a boom in the building industry.

Several of the large manufacturers point out that the production of electrical material is probably as much dependent upon finished products in other lines as any other class of goods, if not more so. For this reason, though the same basic condition of supply and demand is existent, these

producers hold that lower electrical prices must necessarily come almost last in the scale of economic readjustment. Furthermore, in several lines such as electric fans, producers have contracted for their 1921 raw material months in advance. Labor is an important factor in the production of electrical goods and labor prices remain high. The fact that as yet there has been no general tendency to reduce wages is taken as a hopeful sign by many that demand, and hence production, will continue in strong volume.

On the other hand, prices of bare and insulated wire are said to be softening and lower quotations are not unexpected. This easing off of prices, it is stated, is caused by the factor of lower raw material becoming operative, as cotton and copper prices have eased off. A similar factor governs chances of lower prices on conduit and other steel material. The price trend in this line, according to one of the largest supply jobbing houses in this territory, will depend upon the action which steel mills take in regard to quotations. Others oppose this view, however, on the ground that the market for conduit, outlet boxes, etc., is too largely undersupplied to admit of price cuts. The points upon which all interests apparently agree are a persistent optimism regarding the stability of the industry as a whole and the view that price cuts, if made, will not be so general or in the same proportion as in other lines. The reason advanced for the latter statement is that there has been no profiteering or hysteria of price boosting in electrical material during the past few years.

TONE OF THE TRADE IS OPTIMISTIC

With regard to the general optimism of the trade, an analysis of statements recently received by the ELECTRICAL WORLD from about forty of the largest electrical manufacturers, covering twelve major lines of material, is interesting. Barring several noncommittal replies, only two manufacturers reported an appreciable number of cancellations. These were both in the heating-appliance line, one of them being on ranges. Three others reported a few cancellations. These were on bare wire and industrial reflectors. The number of companies that are finding their supply of raw material much improved outnumbered those that reported no change for the better about two to one. The manufacturers whose output was up to normal or above were in the same proportion. A decidedly better labor situation was reported in three out of four cases. Transportation difficulties were very generally improved. On the other hand, about twice as many manufacturers reported stocks in an unsatisfactory condition as reported that supplies were well built up. An encouraging feature is that producers finding an unslackening demand were in the ratio of two to one. Thirteen manufacturers stated that prices will probably increase, while fifteen thought prices will hold steady and four believed a drop is due. These four opinions covered bare and insulated wire, electric ranges and loom. In twenty-nine of the replies the tone is optimistic, three are pessimistic and the rest are noncommittal.

Guy Wire Again Becoming Available

THE shortage in guy wire seems to have been due in large measure to the number of different types of mills required to make the finished product. Because of better labor supply and improved transportation facilities, however, the shortage is gradually being overcome.

The stranding mills have been held up waiting for supplies from the wire mills, and it seems that the wire mills, on the other hand, have been unable to get a sufficient supply of wire rods to permit them to draw sufficient wire to supply the demand for both wire and strands. Trouble started in the steel mills last fall when the stocks of the stranding and wire mills became depleted, and the demand has been so heavy since that time that they have been unable to build up any reserve stock of raw materials to tide over temporary labor and transportation difficulties.

On the higher grade steel strands, such as high-strength and extra-high-strength strands, the shortage is more acute. Mills are promising thirty-day shipments and even better than this on some kinds and sizes of strand.

Fall Lamp Buying Under Way with Good Local Stocks

REPORTS received from jobbers throughout the country indicate that the fall buying movement is making itself felt appreciably in lamp sales. Supplies are apparently holding up well, and there seems little prospect of a shortage prevailing except perhaps on some of the large-size lamps in certain sections.

The Pacific Coast reports that deliveries on the whole are excellent. Demand is picking up. In the Northwest, too, seasonal buying has started, and it is believed that this season will equal last year. No shortage is expected. In the Southwest sales have been good. Complete stocks are available in most instances except on the large sizes. Lamps of 75 watts to 200 watts, type C, are most difficult to obtain. It may be three months before reserve stocks of these sizes have been built up by all jobbers in that section. Stocks of series lamps for street lighting are spotty and demand is growing.

In the Intermountain section also demand is growing. The new "Mazda" type, C-4, is coming rapidly into favor. Reports from the South indicate the usual seasonal demand. Lamps in all sizes are moving briskly, particularly the 25, 40 and 60-watt sizes, with the 100-watt type C lamp showing increasing popularity. Stocks are in good shape, and the anticipated shortage on certain sizes, it is stated, will not materialize.

In the East prospects for good fall sales are excellent. Jobbers in the New York district are finding an increasingly strong demand. The discontinuance of daylight saving the latter part of this month is expected further to strengthen demand. Stocks are in excellent shape on all sizes and types of lamps. In New England, however, the supply is said to be just about keeping up with the brisk demand, and there is, of course, little opportunity for jobbers to accumulate surplus stocks. It is reported that careful distribution will be needed to supply the trade adequately.

Metal Market Situation

THE undertone of the copper market is weak. Producers have lowered their quotations to 18.50 cents, but this price is merely nominal, as consumers remain out of the market. It is stated that 18.50 cents would probably be shaded as an inducement for large orders. Producers are not pressing to sell, however, as production costs remain unchanged and a better volume of buying is hoped for in November. At present, it is reported, the copper output is being curtailed to guard against the accumulation of stocks further weakening the market. Foreign demand remains light. Freer offerings of copper are available in the outside market. Second hands are quoting 17.75 cents for prompt shipment f.o.b. refinery, while November and December delivery ranges from 18 cents to 18.25 cents.

The price of lead eased off ¼ cent the past week, the leading interest quoting 7.75 cents at New York.

NEW YORK METAL MARKET PRICES

	September 28	October 5
Copper	£ s d	£ s d
London, standard spot	93 10 0	96 7 6
	Cents per Pound	Cents per Pound
Prime Lake	18.50–18.62½	18.50
Electrolytic	18.50–18.75	18.50
Casting	17.62½	17.37½
Wire base	21.50–22.00	21.50–22.00
Lead, trust price	8.00	7.75
Antimony	7.12½	7.00
Nickel, ingot	43.00	43.00
Sheet zinc, f.o.b. smelter	12.50	12.50
Zinc, spot	7.75–8.00	7.65–7.75
Tin	43.50	42.37½
Aluminum, 98 to 99 per cent	35.10	35.10

OLD METALS

	Cents per Pound	Cents per Pound
Heavy copper and wire	15.25–15.50	15.00–15.25
Brass, heavy	8.50– 9.00	8.00– 8.50
Brass, light	6.50– 7.00	6.50– 7.00
Lead, heavy	6.50– 6.75	6.25– 6.50
Zinc, old scrap	4.50– 5.00	4.50– 5.00

THE WEEK
IN TRADE

THE electrical industry appears figuratively to be holding its breath to see the effect which widespread price slashing may have upon electrical quotations and sales. In New England lower prices are reported in half a dozen lines, while in New York territory jobbers are slashing prices almost to cost and canceling orders to avoid overstocking. In the St. Louis district trade has been more active the past week, but all other sections report a quieter volume of business than usual. The demand for radiant heaters is making itself felt strongly in certain sections as the result of sudden cold snaps, and lamp buying is also getting well under way. Farm-lighting plants are moving well in the Northwest. In that section the demoralized lumber industry is finding a stronger demand, and favorable conditions of crop harvesting and fruit picking lend an optimistic tone.

Labor conditions are reported satisfactory. The strike of electricians on the West Coast has been settled. Collections generally are slowing up, apparently due to the present business uncertainty. Stocks are well built up in most lines and shipments are now arriving in too great a volume to suit many jobbers. Building construction is proceeding at a rapid pace in Atlanta territory and on the Pacific Coast, but the industry in other sections is rather quiet.

NEW YORK

During the past week a pronounced tendency to shade prices has been felt. In some cases quotations are being made within 2 or 3 per cent of cost with no buyers in the market. The witholding by retail consumers and builders has been reflected to a greater extent to the jobbers who are seeking a market for overstocks in such lines as wire and armored cable. That is, the present is a strong buyer's market, with little trading and generally dull tone. Collections have lengthened to sixty-five days from a normal of thirty to forty days. The volume of business during the past week has ranged from 15 per cent above to 15 per cent less than the average in August, with the expected fall demand still holding off. A few inquiries only have deen reported for Christmas business. Orders on manufacturers are being canceled to prevent overstocking, and jobbers' sales are being made in some cases on a non-cancelable basis. Requests on manufacturers to guarantee prices have thus far been refused. No building is being undertaken, and that supply equipment which is being sold is for alterations or small extensions. The embargo from Pittsburgh has been removed.

Wire.—Large stocks of wire are held by almost all jobbers and the assortment is good. Some jobbers report two, three or four months' stocks. Prices of No. 14 rubber-covered are shading down quotations from $10.50 to $11.50 per 1,000 ft. The movement is very sluggish with orders on factories curtailed or canceled.

Flexible Armored Cable.—Almost all jobbers have quite good stocks and some have undesirably large supplies with a very weak market, typical reports being that the last month's sales have been one-tenth of normal. Some of the smaller manufacturers are reported as going after business at any price. Two wire cable quotations range around $94 per 1,000 ft. in the larger lots to $98 to $100 per 1,000 ft. for small lots.

Rigid Conduit.—Stocks of conduit are spotty with some jobbers entirely out of stock and a very few with a fair supply on hand. Under these conditions quotations naturally are unstable. One-half-inch black in 5,000-ft. lots is quoted at $85 per 1,000 ft., smaller lots at $92 to $94 per 1,000 ft. One-half-inch galvanized is quoted at $100 per 1,000 ft.

Schedule Material.—Stocks are spotty and low, especially in lines where porcelain enters largely into the product. Extensive shading in prices is reported, in some cases quotations are said to be 21 per cent off list. These lines are being most closely watched by both jobbers and retailers.

Heaters.—The cooler weather of the last week has stimulated the sales of heaters slightly. Stocks are fair and prices remain unchanged as yet.

Hollow Ware.—Stocks are reported as being practically depleted in all lines; back orders are over a year old; manufacturers are refusing new orders. Retail sales are restricted, it is claimed, by high prices.

Vacuum Cleaners.—Demand is fair with good stocks and deliveries sufficient to keep stocks up to normal.

Washing Machines.—Sales are good for the time of year. No marked decrease in sales has been felt.

Small Motors.—Stocks are very low and spotty with little demand. Some jobbers have had no deliveries for four or five months and manufacturers are quoting on thirty to forty weeks' delivery.

CHICAGO

The effect of widespread price cutting in other lines is felt in the electrical trade with varying intensity in different branches. As the electrical manufacturer has been very conservative in price increases during the past four years, electrical goods are likely to be the last and the least affected by a shrinkage of value. Since labor is so large a portion of the manufacturing cost, no appreciable reductions are seen until labor costs are cut.

In this district, however, the disposition on the part of buyers is to await developments. Large corporations, municipalities, etc., are still buying in about the same proportion as in the past, but retail trade, dependent wholly on popular opinion, has been sharply reduced. Sales of household appliances are at a standstill, with the sole exception of heaters. These are under heavy demand due to the sharp cold snap Chicago is experiencing. Reduced sales are permitting the building up of jobbers' stocks, and it is not felt that the quiet period will be of sufficient duration to become troublesome.

Labor is becoming plentiful. One of the large jobbers recently received 144 answers to a five line advertisement for warehousemen in which the wage was stated to be 56 cents per hour. This situation is due to the large number of reductions in forces employed by many local plants and by the influx of labor from the automobile centers. The only price reductions noted are on wire, where labor cost is a negligible feature.

Bare Copper Wire.—Following the trend of electrolytic copper some manufacturers are quoting on a 22½-cent base. Current jobber's price on No. 8, in 200-lb. lots, is $22.75 per 100 lb., and on No. 10, $23.

Weatherproof Wire.—Stocks of weatherproof are much improved and factory deliveries are approaching normal. Reduced raw material costs have caused a 2-cent cut. No. 12 triple braid is now quoted by jobbers at 32 cents per lb., and No. 6 triple braid at 29 cents, these quotations being for 500-lb. lots.

Steel-Tape Cable.—An expected advance has apparently been forestalled by reduced costs. Deliveries range from 90 to 120 days. The price of 600-volt solid duplex No. 8 is $205.47 per 1,000 ft., and 2,500-volt solid single No. 6 is $202.73 per 1,000 ft., in 2,000-ft. lots.

Flexible Armored Conductor.—Jobbers' stocks, with slightly reduced demand, are getting in better shape. No price change has been announced. Quotation on No. 14 single-strip, in coil lots, is $110 per 1,000 ft.; in smaller quantities, $120 per 1,000 ft.

Line Hardware.—Recent increases have had little or no effect on demand. Factories are gradually turning out goods in better shape. Some stock is in the hands of jobbers. Deliveries are now requiring sixty days.

Ornamental Iron Poles.—Factories are adding increased freight to old quotations, no fluctuation in price being

anticipated. The material is all fabricated to order and deliveries are good, thirty to forty-five days being quoted.

Ornamental Tops.—Glassware and tops for poles are still very hard to get, from sixty to ninety days being required for delivery. Numerous cases are noted where the poles have been set for some weeks and completion of the job is delayed on account of missing tops.

Hollow Ware.—The market is still undersupplied in spite of greatly reduced demand. Retail trade is at a minimum. The public seems to be looking for a reduction in price, which those familiar with the line say cannot occur.

Household Appliances.—The wave of conservative buying has hit these items pretty hard. It is felt that as soon as the general public realizes that prices are firm business will resume its former stride. Reports are heard of reduced production by some makers.

BOSTON

Price cutting among the smaller jobbing houses within the last few days has led to a general reduction in quotations on fast-moving supplies. Many of the leading wiring materials are off from 6 to 12 per cent. Overstocking, due in part to heavy orders placed in the past and in part to the arrival of long-delayed shipments of material, appears to be responsible for the present movement to dispose of supplies on hand and make payments to manufacturers thereof. Factory prices are holding firm. Among the larger jobbers the present slump is looked upon as temporary. Collections are still unsatisfactory, and the use of acceptances has made its appearance even among very large customers. Deliveries continue to show improvement. Building operations are very unsatisfactory locally as to volume, although some large apartment-house work is being pushed for suburban occupancy. An agreement is announced between employers and factory workers in the Lynn shoe industry as to wages. Labor conditions in the electrical field are fairly good. Wages are being maintained at their present level.

Flexible Armored Conductor.—Prices are off, No. 14 single-strip in 1,000-ft. lots or over selling at $85 per 1,000 ft., compared with $100 last week. Stocks are of liberal size.

Rubber-Covered Wire.—Easier prices, running down to $10 per 1,000 ft., on No. 14 solid slow-burning, in 5,000-ft. lots, are noted. Stocks are equal to current demands.

Weatherproof Wire.—A drop of the base price from 29 cents last week to 27 cents is noted. Shipments are coming in well and the demand is fair.

Bare Copper Wire.—The base price has fallen from 24 cents to 22.5 cents during the past week. The feeling is widespread in the trade, however, that copper is selling at too low a price in the ingot and a later advance would not be surprising.

Non-Metallic Flexible Conduit.—Heavy shipments appear to have upset the market, in view of the somewhat spotty demand. Reductions in the price of cotton do not seem to have reached the electrical manufacturer's raw material as yet sufficiently to lower prices to jobbers. On 3/2-in. loom the price per 1,000 ft. in 5,000-ft. lots is $29, against $33.50 last week. The ¾-in. size is quoted at $33, against $35.50 last week. Good stocks are in hand, with moderate demand.

Sockets.—In case lots pulls sell for 45 cents net, compared with 50 cents a week ago. Key sockets are moving at 26 cents, against 28 last week, and keyless have dropped from 26 to 24 cents. The small amount of building work compared with needs of the district is cutting down demand.

Tape.—Prices hold firm, notwithstanding recent reductions in the price of cotton. On ¾-in. black, in 100-lb. lots, a rate of 58 to 60 cents per pound is quoted. There seems to be no shortage of this material.

"Nail-it" Knobs.—Prices are easier, the latest quotation being $32 per 1,000 on lots of 4,000 or more. Heavy shipments have been received.

Rigid Conduit.—This material continues relatively short, though here and there modest orders can be filled from jobbers' stocks. Galvanized pipe is harder to get than black. On ½-in. galvanized $102 per 1,000 ft. is being asked, and on 1-in. galvanized $200. The price of ½-in. black conduit is $96 per 1,000 ft., and on 1-in. black $189.50.

Motors.—Increased manufacturing facilities have brought better stocks of fractional horsepower and small motors into the local market, although nothing like a real surplus appears generally in hand. New makes of motors are bidding strongly for patronage, and the excellent deliveries some of these offer are appealing to the trade.

Washing Machines.—Deliveries are greatly improved. One representative distributer had about three carloads in stock Monday and was quoting $128 per machine, galvanized tank, in lots of six, to legitimate dealers. Interest in ironers is growing.

Vacuum Cleaners.—Good retail stocks are on hand, and the flow between factories and dealers is well maintained.

ATLANTA

Fewer orders to cotton-duck mills from tire manufacturers, together with reduced prices on cotton textile, have caused some of the large mills to postpone proposed extensions and additions. This has caused the orders for electrical material involved to be put off. Jobbers report a reduction in the number of orders received, but this is not causing any uneasiness as it is largely due to the between-season slump in business activities. Trade in Atlanta, however, is still booming, owing to tremendous building operations under way. Building permits for September in Atlanta reached $1,100,000, this being the second largest month of the year. Predictions are that the total will reach $14,000,000 by the end of the year. A great number of moving-picture theaters and commercial buildings are under construction throughout the territory and jobbers report large sales of fixtures and other material for this class of business.

Confusion regarding the policy that banks will pursue in making loans on warehoused cotton is causing some uneasiness in the rural districts. The general opinion seems to indicate that there will be ample funds for the proper and normal moving of the crop. Collections continue somewhat slow, and banks have called on jobbers for a 50 per cent reduction in the amount of paper presented for discount. As the movement of cotton gets under way, however, this condition should improve and the tight money situation be considerably relieved.

Transportation continues to show improvement. All houses report a considerable betterment in the receipt of shipments and fair stocks of nearly all lines of material are either on hand or rolling.

Rigid Conduit.—Good stocks of black are reported by all houses, but galvanized is still scarce. Prices, black, less than 2,500 lb., ½-in., $8.89; ¾-in., $11.80; 1-in., $17.44; galvanized, ½-in., $9.40; ¾-in., $12.49; 1-in., $18.46.

Distributing Transformers.—Slight relief from the acute shortage of this article is noted. Several fair-sized shipments have been received, while others are reported for reasonably prompt delivery in all sizes from 1 to 50 kva.

Flexible Armored Conductor.—While recent shipments have been sufficient to take care of outstanding orders, brisk demand has prevented the accumulation of any stocks. Shipments are coming through more satisfactorily than for some months past.

Pole-Line Hardware.—Price increases averaging 10 to 30 per cent are reported on all lines. Sales are very good with stocks holding up well under the circumstances. Difficulty is experienced in obtaining 26-in. galvanized braces. Price, cross-arm braces, lots of from 100 to 500, 20-in., $16.36; 24-in., $20; 26-in., $21.20.

Wire.—Good stocks of both rubber-covered and weatherproof are on hand. Some slight difficulty is experienced in filling orders for the more popular sizes. Incoming shipments should fill all back orders and permit stocks to accumulate.

Lead-Covered Cable.—Shipments continue satisfactory on the more popular sizes. Local stocks are depleted.

Holiday Goods.—Retail orders are good but no shipments of moment can be made as jobbers have not yet

received their allotments from factories. Hollow ware is available only in sufficient quantities to meet the current demand. Unless shipments in this line greatly increase within the next thirty days, a shortage is predicted.

ST. LOUIS

Trade has become more active during the past week, almost all jobbers report. This is felt to be a hopeful indication of good business conditions this fall. Unseasonably cold weather has helped sales of heating devices considerably. In spite of the better volume of trade the past week most jobbers report that the total business for September will fall short of the total for August, though it is larger than in September of last year.

New business has not been large, but manufacturers are delivering big shipments in many lines and jobbers are applying these on back orders. The number of inquiries during September was exceptionally large, according to some jobbers, in spite of the fact that new business was slow. One jobber reported having 5,000 inquiries during the month.

Stocks are good in most lines and care is being taken to prevent overstocking. This fear of overstocking has caused a number of cancellations on the part of jobbers, who state that they cannot dispose in three months of a year's supply finally shipped to them by manufacturers. The total amount of building construction in St. Louis proper during September was only 25 per cent of the total for September, 1919.

Wire.—Stocks of rubber-covered wire are good, but the supply of weatherproof is spotty. Demand is good, particularly for weatherproof in sizes No. 8 to No. 14. No. 14 rubber-covered is selling for $11.50 per 1,000 ft. in 5,000-ft. lots, and $32.35 per 100 lb. in lots of 1,000 lb. or more.

Rigid Conduit.—The supply of ¾-in. black is better, but the ½-in. size is still short. The stock of larger sizes is good. Demand is reported satisfactory. One-half-inch is quoted at $80 per 1,000 ft. in lots of 5,000 ft. or more, and ¾-in. at $110 per 1,000 ft. in lots of the same size.

Transformers.—Jobbers can supply the demand in the smaller sizes from 10 kva. to 150 kva. Deliveries of larger sizes, however, cannot be made under several months. Smaller transformers range from three to four weeks. Demand is better for the bigger sizes, coming chiefly from industrial plants.

Linemen's Tools.—Stocks are exhausted and the few small shipments to jobbers recently have not been able to cut down back orders appreciably.

Electric Irons.—Good stocks have accumulated for the fall trade. Jobbers are now getting immediate delivery. Shipments are beginning to be made to retailers on orders placed last January for the present fall trade. Retailers report very satisfactory sales.

Washing Machines.—Large stocks are on hand here. Demand is reported as spotty.

Vacuum Cleaners.—Jobbers have good stocks and report a fair demand. Retailers say their sales are satisfactory.

Lamps.—Stocks of series lamps for street lighting are better than a month ago. Demand is still reported active. Demand for other types in all sizes is good and stocks are improving. The 75-watt to 200-watt type C lamps are easier to obtain.

Locust Pins.—Good stocks are on jobbers' shelves. Demand is coming mostly from railroads, though there have been a large number of inquiries from utilities. Current price is $60 per 1,000 in lots of 5,000 or more.

Tape.—Normal supplies are in stock. A steady demand is reported. The ¾-in. black is quoted at 55 cents per pound in large lots.

SEATTLE—PORTLAND

Jobbers in Seattle and contiguous cities report that with the exception of an increasingly heavy movement of farm-lighting plants sales show no particular increase over the several weeks past. The season for farm lighting is at hand, crops are nearly harvested, and farmers have started making needed installations. Demonstrations at state and county fairs are doing much to increase sales. Stocks are in good condition and freight from the East is coming through satisfactorily. This also applies to other stocks with the exception of heavy power apparatus such as motors, generators, etc. These latter items are not moving to any extent. Appliance sales are well sustained, particularly in washing machines, ranges, electric tableware and socket device heaters. Ranges alone in this line are hard to obtain. The lamp season has opened with good sales reported. This only applies to residential types as industrial lamp sales have been very poor. Lamp stocks are in excellent shape.

Prices show no change of importance with the exception of increases made necessary by higher freight rates, ranging from 25 to 33 per cent. September reports from various sections of this district show that favorable crop conditions continue to prevail. Harvesting is proceeding apace and picking of fruit is in progress. The quantity and quality of these products are reported good, but prices are still uncertain and this is causing an underlying note of concern. Heavy railroad buying plus heavy purchasing for water delivery added materially to the new business accepted by West Coast lumber mills during the last week in September. Approximately 40 per cent of the buying was railroad material.

Portland manufacturers and jobbers report that business is continuing in good shape. This is also true of wiring contractors. Electrical dealers state that business is improving materially, with lamps, vacuum cleaners, washing machines and electric heaters showing the greatest activity. Jobbers report that stocks of electrical appliances for the holiday trade are in excellent shape with the two or three exceptions of percolators, toasters and two-disk hot plates.

SAN FRANCISCO

Business is reported quiet except in the southern part of the state, where there is a great deal of building under way, especially in Los Angeles. It is stated that the value of building permits for Los Angeles during the year 1920 will be approximately $50,000,000. The total for September in Los Angeles is $7,231,440, in San Francisco $1,996,612, and in Oakland $798,619. This compares with totals in the same cities for September, 1919, of $2,447,793, $1,231,921 and $574,350, respectively.

The labor situation has been settled by granting demands of the electricians' union. Members are now paid on a basis of $10.50 per day for foremen and $10 per day for workers. It is expected that the power conservation regulations now in force in the bay cities will soon be remitted because of the withdrawal of the irrigation load, especially that required by the rice fields. The steel towers leading from the Caribou project of the Great Western Power Company have been placed and the aluminum cable is rapidly being strung. This power should be available early in 1921. It is predicted that the Pacific Gas & Electric Company's 220,000-volt energy will be brought down from the Pit River about ten months later.

Panelboards.—High labor charges have created a better call for ready-made panelboards from Eastern manufacturers. Additional lines, such as the Benjamin, will be more extensively stocked in the near future.

Rubber-Covered Wires.—Jobbers report that stocks in general are moving very nicely. The endeavor to maintain the complete stocks required by the great distance from the source of supply has resulted in accumulations of some odd quantities.

Schedule Material.—Some complaints are heard because the safety switches shipped from the East do not bear the union label, although this practice is now customary. This is resulting in an intermittent demand for certain cheaper switches complying with state regulations which are made locally and carry the union label.

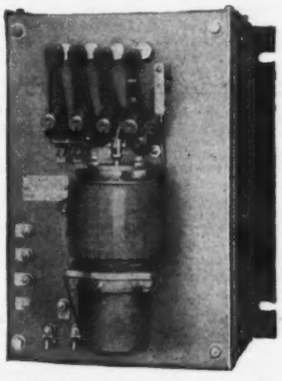
Dishwashers.—No other feature of the electrical home attracted so much attention as did the electrical dishwasher. Dealers have booked many orders. These are nearly all advance sales, for there are no local stocks at the present time, although November shipments are promised.

NEW APPARATUS & APPLIANCES

A Record of Latest Developments
and Improvements in Manufacturers' Products
Used in the Electrical Field

Time-Limit Automatic Starter

For starting direct-current motors carrying loads which are liable to vary between wide limits and where remote



ACCELERATING FINGERS CLOSE AS THE ARMATURE MOVES UPWARD

control is desired, the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has redesigned its No. 6105 time-limit automatic starter to include both larger and smaller sizes than formerly. The new starter is made in capacities ranging from ¼ hp. to 10 hp. at 115 volts and up to 25 hp. at 230 volts and 500 volts. The air dash-pots formerly used are replaced by oil dash-pots.

High-Voltage Bus Support

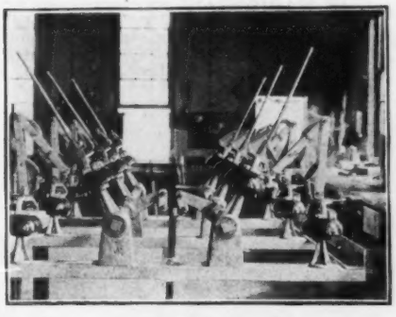
For 66,000 volts and higher ratings the Delta-Star Electric Company, Chicago, has developed the unit-type rigid

UNITS MAY BE REPLACED WITHOUT CHANGING ENTIRE SUPPORT

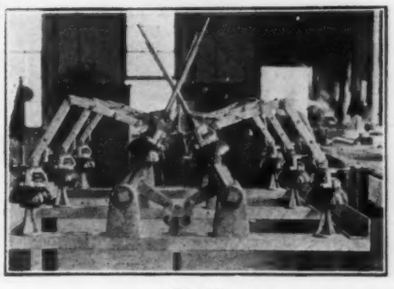
support illustrated. This unit is assembled from standard sections, each securely joined together by four bolts, resulting in a support of high mechanical strength and high electrical flashover. This unit-type support is also furnished for underhung conductors of 45 deg. mounting and can be equipped with any of the various buses or conductor fittings of the unit-type design.

Pole-Top Switch

Pin-type insulators used in such a way that they are under compression, wiping contacts of large area and under considerable pressure, arcing horns designed quickly to bring the arc to the ends of the horns and a lever ac-



Open



Closed

ACTION OF SWITCH INDICATED BY CLOSED AND OPEN POSITION

tion that gives positive action are the features of the pole-top switch just placed on the market by the Lewis & Roth Corporation, Philadelphia. At present these switches are being made in 15,000-volt ratings.

Notes on Recent Appliances

Washing Machine

A washing machine of the oscillating type has been developed by the Voss Brothers Manufacturing Company, Davenport, Iowa.

Ozonator

An ozonator for cold storage rooms has been developed by the Ozone Company of America, Milwaukee, Wis.

Regenerative Receiver

A small coupler or receiving transformer, a variometer connected in the grid circuit and a variometer connected in the plate circuit, together with a grid condenser and grid leak, are the features of the new type ZRF wireless receiver placed on the market by the Clapp-Eastham Company, Cambridge, Mass. The panel is of ¼-in.

FOR LONG DISTANCE SHORT-WAVE WORK

bakelite and is 14¾ in. long and 5¼ in. high to match detector and amplifier panels put out by the same company.

Pendent Luminous Heater for Household Use

A 660-watt pendent luminous heater for household use is being offered by Adon Products, Inc., 516 Fifth Avenue, New York City, attachable to any 120-volt alternating or direct-current circuit. The device is tubular in shape, with a perforated metal shell to protect the heating elements and with arrangements for securing baffles and deflecting disks. All outside parts are nickel-plated. Contact parts are insulated with heavy mica.

Bench Drilling Stand

A unit-type bench drill stand on which is to be attached an electric drill, which is adjustable for height and which may be swung from over its base to permit drilling in pieces too large to rest on the bench, has been placed on the market by Black & Decker, Baltimore. The height from bench to top of column is 30 in., the

PUTS ELECTRIC DRILLS TO NEW USE

vertical adjustment of the drill 12 in. the drilling radius 7 in., the vertical feed 4 in. and the net weight 70 lb.

MANUFACTURERS' ACTIVITIES

Record of Changes Affecting Sales and Distribution
Together with Trade Personals and Notes on Foreign Trade,
Jobbers' News and New Trade Literature

THE NATIONAL FIBRE & INSULATION COMPANY, Yorklyn, Del., manufacturer of electrical insulation products, has filed notice of an increase in capital from $500,000 to $3,000,000 for proposed expansion.

GENERAL ELECTRIC COMPANY, Schenectady, N. Y., has purchased the United Button Company's plant on Grand Street in the Bushwick section of Brooklyn, it is reported. The property contains about 100,000 sq.ft., and costs about $500,000, it is said.

THE WETMORE-SAVAGE COMPANY, 76 Pearl Street, Boston, held its employees' annual outing at Centennial Grove, Essex, Mass., on Sept. 6, 1920. The day was taken up with field events, baseball and clambake.

PENNSYLVANIA ELECTRIC ASSOCIATION, at its annual convention held last month at Bedford Springs, gave its usual exhibit of electrical products. A number of manufacturers had their products on display, making in all a very attractive exhibit.

THE NATIONAL LAMP WORKS of General Electric Company at Nela Park, East Cleveland, Ohio, was judged the best-kept industrial establishment in the country in a recent magazine contest. During the nine years since the plant was established the entire plot has been turned into a park. The exteriors of the buildings have been so designed and the buildings so grouped as to have earned for the plant the name "University of Industry."

THE ARROW ELECTRIC COMPANY, 99 Hawthorne Street, Hartford, Conn., is planning an extensive alteration to its factory building.

THE HURLEY MACHINE COMPANY, Chicago, reports that the eight months ended Aug. 31, 1920, show sales and net profits double those of the corresponding period last year. For 1919 this period showed net sales of $3,163,006 and in 1920 $7,138,456. The net profits after depreciation in this period in 1919 were $580,159 and in 1920 $1,108,241.

PHILIP L. ROSE has been elected treasurer and A. A. Adams, controller of the American Waterworks & Electric Company, New York. Cecil S. Ashdown, vice-president and treasurer, has resigned to join the Remington Typewriter Company.

W. P. MORGAN, JR., formerly connected with the St. Louis office of the Robbins & Myers Company, has joined the sales force of the Chandeysson Electric Company, St. Louis, Mo.

THE YOUNGSTOWN SHEET & TUBE COMPANY, Youngstown, Ohio, held its ninth annual field day on Sept. 6, 1920, at Campbell Park, which has been equipped by the company for the use of its employees for recreational purposes. Field events, baseball and dancing occupied the day.

THE KING WASHING MACHINE CO., Wolcott, Ind., announces the appointment of T. R. Allen as general manager and O. B. Askren as general sales manager of that company.

THE THOMPSON-LEVERING COMPANY, 327 Arch Street, Philadelphia, manufacturer of electrical instruments, a firm which has operated for many years under this name, is to be incorporated under the same name with no change in management or policy. W. J. Thompson, A. J. Levering and D. J. Corcoran are to be officers of the company.

THE HABIRSHAW ELECTRIC CABLE COMPANY, Yonkers, N. Y., and its subsidiaries report net sales for the six months ended June 30, 1920, of $6,064,790 and for the quarter ended on the same date, of $3,406,921. This is an increase during the second quarter of $749,052, or 28 per cent, over the first quarter.

THE GENERAL ELECTRIC COMPANY, Schenectady, N. Y., announces that an arrangement has been made whereby the General Electric Company has acquired a substantial interest in the Locke Insulator Corporation, and the following are the now existing officers and directors: President, Donald Symington; vice-presidents, John F. Symington and F. H. Reagan; treasurer, W. G. Hoffman, Jr.; secretary, J. F. Douty, Jr.; directors, G. E. Emmons, C. W. Appleton, D. R. Bullen, J. W. Upp, George P. Baldwin. This arrangement, the General Electric Company announces, will result in full engineering and research co-operation between the two companies with respect to insulator problems. The Locke company will now produce the Hewlett high-tension transmission insulator, taking advantage of the additional facilities supplied by the completion of its new plant at Baltimore, Md.

THE VICTOR ELECTRIC COMPANY, 116-20 West Thirty-second Street, New York, is arranging for a consolidation of its interests with the X-Ray Supply Company, New York. Edwin W. Kelly is secretary.

PENNSYLVANIA ELECTRIC ASSOCIATION EXHIBIT

Foreign Trade Notes

FABRICANTES ASSOCIADOS DE MAQUINARIA, Havana, Cuba, has been consolidated with the Atlantic Trading Company of that city. The new organization is capitalized at $500,000 and proposes to conduct a distributing business of engineering equipment and electrical supplies. It will represent a limited number of electrical machinery and supply manufacturers. T. C. Ulbricht, president of the company, was formerly one of the officials of the American Steel Company of Cuba, having previously been connected with the Havana Electric Railway, Light & Power Company. H. W. Brooks, vice-president and general manager, was for a number of years connected with the Westinghouse Electric & Manufacturing Company, and during the war was chief of the machinery section, Bureau of Ordnance, U. S. Navy.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washingon, by mentioning the number.

A hotel in Guatemala (No. 33,784) wishes to purchase an intermittent electric sign.

A firm of wholesale dealers in India (No. 33,796) desires to purchase electric fans.

A municipality in the Azores (No. 33,790) asks for bids for the construction and maintenance of a hydro-electric plant. Supply and installation of all electrical and mechanical appliances, machinery and turbines is desired.

Trade Publications

ELECTRIC ARC FURNACE REGULATOR.—The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued leaflet No. 3,461, covering automatic current regulator for electric arc furnaces with movable electrodes.

MECHANICAL EQUIPMENT.—The Walworth Manufacturing Company, Boston, has issued a foreign export catalog No. 35 in English, Spanish, Portuguese and French, covering its line of valves, fittings and engine specialties.

ELECTRIC BRASS MELTING.—The Acheson Graphite Company, Niagara Falls, N. Y., has recently issued a booklet outlining the advantages of electric furnaces for melting brass.

ELECTRIC HOISTS.—The Sprague Electric Works of the General Electric Company has issued bulletin No. 48,961 on type W, 1-ton to 6-ton, direct and alternating-current, floor-controlled hoists.

SMALL MOTORS. — The Emerson Electric Manufacturing Company, St. Louis, Mo., has issued price and data book No. 50, in which are listed motors up to 2 hp., forge blowers, exhausters, ventilating-fan motors and grinding and polishing lathes.

IRON AND STEEL MILL EQUIPMENT. —The General Electric Company, Schenectady, N. Y., has issued bulletin No. 48,031 to supersede bulletin No. 4923. The new bulletin covers the use of electricity in the iron and steel industry.

ELECTRICAL WELDING.—The Electric Welding Company, Brooklyn, N. Y., has issued a new booklet, No. 1,001, covering electric arc welding.

STEAM COIL HEATERS.—The Buffalo Forge Company, Buffalo, N. Y., has recently issued catalog No. 460, describing its complete line of standard coil heaters.

METERING TRANSFORMERS. — The Packard Electric Company, Warren, Ohio, has issued bulletin No. 208, describing its single-phase, two-phase and three-phase potential and current transformers.

BEARINGS.—The Fafnir Bearing Company, New Britain, Conn., has issued a new booklet, No. 20: "Fafnir Ball Bearings for Your Machines."

New Incorporations

THE ELECTRIC APPLIANCE COMPANY, Frederick, Md., has been incorporated by M. A. Pooler, R. Paul Smith and Raymond E. Town. The company is capitalized at $25,000 and proposes to manufacture electric and gas supplies.

THE WALKER MANUFACTURING & SALES COMPANY, Boston, Mass., has been incorporated by Louis J. Walker, Arthur L. Weston and Robert T. Anthony, Hudson, Mass. The company is capitalized at $25,000 and proposes to do an electric welding business.

THE WIZARD ELECTRIC SWEEPER COMPANY, Elyria, Ohio, has been incorporated by H. M. Davies, R. S. Davies, R. E. Cuthbertson, L. N. Webber and C. H. Brown. The company is capitalized at $25,000 and proposes to manufacture a new model electric sweeper.

THE BRANCH ELECTRIC LAMP COMPANY, 173 Mercer Street, Jersey City, N. J., has been formed to manufacture electric lamps. Emanuel D. Bach is promoter of the company.

THE MAIN ELECTRICAL COMPANY of Marshall, Mich., have filed articles of incorporation with a capital stock of $1,000.

THE PORCELAIN INSULATOR CORPORATION, Lima, N. Y., has been incorporated with a capital stock of $250,000 by W. F. Harvey, D. H. Finucane and E. P. Doran, Lima, N. Y.

THE WRIGHT BATTERY COMPANY has filed articles of incorporation under the laws of the State of Delaware with a capital stock of $1,000,000. The incorporators are M. L. Horty, M. C. Kelly and D. L. Mackey, Wilmington, Del.

THE BOYERTOWN ELECTRICAL SUPPLY COMPANY has been organized by E. M. Yoder, Boyertown, Charles G. McAvoy, Philadelphia, and others to manufacture electrical equipment.

THE RURAL FARM POWER COMPANY, Macon, Ga., has been organized by J. A. Harris, George S. Avant and others to manufacture electrical equipment for farm service.

THE EASTERN ELECTRIC MANUFACTURING COMPANY, Bridgeport, Conn., has been incorporated by E. A. Harry, Milford, Conn.; R. M. Gambino and Frank Flammina, Bridgeport. The company is capitalized at $100,000 and proposes to manufacture electrical devices, etc.

THE PNEUMELECTRIC CORPORATION, Syracuse, N. Y., has been incorporated with $40,000 of preferred stock and 2,000 shares of no par value common stock, by J. L. Wagner, W. S. Timmins and L. P. Smith, to produce electric hoists, punches and drills for coal mines.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

DANVERS, MASS.—Bids will be received by the Commission of Mental Diseases, 36 State House, Boston, until Oct. 14 for the erection of a power plant and equipment at the State Hospital. The cost is estimated at $250,000.

PLAINVILLE, CONN.—Whiting & Davis, silversmiths, contemplate the erection of a factory addition and the installation of electric generators.

Middle Atlantic States

BUFFALO, N. Y. — The National Lamp Works of the General Electric Company, care of F. S. Terry, Nela Park, East Cleveland, Ohio, contemplate the erection of a power house to cost about $200,000. George H. Johnson, Nela Park, East Cleveland, Ohio, is architect.

JAMESTOWN, N. Y. — The Dahlstrom Metallic Door Company contemplates the installation of a 300-hp. synchronous motor-generator set. Changes to the lighting system are also contemplated. J. A. Westman is general manager.

NEW YORK, N. Y. — The Bronx Company, 177th Street and the Bronx River, contemplates the replacement of steam power by electricity and increasing present capacity of substation by 400 kva., the installation of steam turbines in generating plant is also planned. Philip T. Brown is electrical engineer.

PHILADELPHIA, PA. — William Steele & Sons Company, Sixteenth and Arch Streets, has been awarded the contract by the Reyburn Manufacturing Company, Twenty-third and Allegheny Streets, for the construction of several buildings including warehouse, power house, etc. Equipment for power house will be required.

North Central States

CLEVELAND, OHIO.—The Allen Theater Enterprises, R. J. Bulkley, agent, Richmond Street, Toronto, Canada, contemplates the erection of a power plant for a new theater and commercial building. A. M. Allen Company, 1900 Euclid Avenue, is engineer.

BEATTYVILLE, KY. — The Beattyville Light & Power Company has increased its capital from $50,000 to $75,000. Improvements to the plant are contemplated.

BLACKEY, KY.—The Rockhouse Coal Company contemplates the installation of a power plant to cost about $50,000.

COVINGTON, KY.—At the general election the proposal to issue $250,000 in bonds will be submitted to the voters for the installation of a 10,000,000-gal. electric triple-expansion pump at the waterworks. J. M. Louk is superintendent of the waterworks.

HAZARD, KY. — The Hazard Light & Power Company and West Virginia & Kentucky Power Company have consolidated at Lothair, one mile from Hazard. It is planned to construct high-tension transmission lines through the Kentucky River, the Big Sandy River coal fields, etc., and supply nearby towns.

LEE, KY.—The Cumberland-Hazard Coal Company contemplates the installation of a power plant to cost about $75,000. Work will be started at once.

PIKEVILLE, KY. — The Pike Light & Power Company will make immediate improvements to cost about $40,000.

SALLYERSVILLE, KY.—The Sallyersville Light & Power Company has plans under way for the installation of a plant to cost about $25,000. G. W. Ramey is interested.

WASIOTO, KY. — The Wasioto Light & Power Company, recently organized by E. M. Bell and others with a capital of $30,000, contemplates the installation of a plant.

CHICAGO, ILL.—Bids will soon be received by the Charles A. Stevens Company, 33 South Jefferson Street, for the erection of a warehouse, garage and power house to cost about $75,000.

SPARTA, WIS.—The Angelo plant of the Wisconsin-Minnesota Light & Power Company, it is reported, has been destroyed by fire. In order to renew permanent service the company plans to erect a transmission line to La Crosse to be connected with the main transmission system.

SUPERIOR, WIS.—The Great Northern Railroad, 175 East Fourth Street, St. Paul, Minn., contemplates the installation of motors for the electric operation of its No. 3 iron ore dock, which is now being rebuilt.

ATWATER, MINN. — An electric light and power company is in the process of organization for the installation of an electric lighting system at this place. Address Edward Feig.

DULUTH, MINN.—The city officials contemplate extensions to the electric lighting system on Central Avenue from Roosevelt to Cody Street and on Grand Avenue from Fifty-fourth to Fifty-ninth Street. P. G. Phillips is commissioner.

NELSON, MINN. — The Nelson Light & Power Company plans to erect a transmission line to Alexandria.

NORTHFIELD, MINN. — Petition has been made to the City Council for the installation of a new street-lighting system in this place. R. H. Moses is city clerk.

TWO HARBORS, MINN.—The Duluth & Iron Range Railroad Company contemplates the installation of a switchboard and the erection of a lead-covered aërial cable (100 lines) from First Avenue to Eleventh Avenue. Plans also include the construction of rural lines to the Silver Creek district and to the St. Louis county line. Cost is estimated at $10,000.

VIKING, MINN.—The installation of an electric lighting system is contemplated by the city officials.

CLINTON, IOWA.—The Clinton Gas & Electric Company contemplates the installation of additional turbines to develop 3,500 kw.

FERTILE, IOWA. — The city officials contemplate the installation of an electric lighting system. J. T. Tallackson is city clerk.

GRESHAM, NEB.—At a recent election bonds for a lighting system were carried.

SIDNEY, NEB.—Bids will be received by I. G. Graybill, Mayor, until Oct. 15 for remodeling present power plant and furnishing one engine, generator, etc.

BURLINGAME, KAN.—The city officials contemplate the erection of a power plant to cost about $70,000. Black & Veatch, 701 Mutual Building, Kansas City, Mo., are engineers.

CLAY CENTER, KAN. — At a recent election bonds to the amount of $80,000 were carried for repairs and equipping the municipal electric light plant.

WELLINGTON, KAN.—Johnson & Benham, consulting engineers, Firestone Building, Kansas City, Mo., have been appointed to prepare plans and supervise the construction of improvements to the electric light plant, including the installation of a turbine, generator, boiler, etc.

Southern States

WILSON, N. C.—The installation of an electric light system to cost about $110,000 is contemplated.

TRION, GA.—The Trion Company, Inc., contemplates the erection of an addition to its power plant. Jackson & Moreland, 387 Washington Street, Boston, Mass., are engineers.

JACKSONVILLE, FLA.—Bids are being received by the City Commission for the erection of a high-tension transmission line to the plant of the Federal Ice Company at Moncrief. The cost is estimated at $13,000. William Edwards, Engineer Building, Jacksonville, is engineer.

JACKSONVILLE, FLA.—Bids will be received by the City Commission until Oct. 15 for furnishing and delivering one 333-kva. oil cooled transformer, 6,600 to 13,200 volts primary, 2,300 volts secondary, 60 cycles, 7,200 alternations, provided with four 2½ per cent full capacity taps in the 13,000 volt winding, or two 5 per cent taps in the 6,600-volt winding. Bidders are also requested to state what allowance will be made for three burned out 300-kva. General Electric water-cooled transformers, 60 cycles, 6,600 volts primary, 2,200 volts secondary.

OKLAHOMA CITY, OKLA. — The Oklahoma Terminal Elevator Company has plans under way for the construction of an elevator building to cost about $600,000. Motors will be installed for electric power. P. L. Jackson is secretary.

AMARILLO, TEX.—An issue of $30,000 in bonds was carried for the installation of an electric fire-alarm system at this place.

BALLINGER, TEX.—The city officials plan to erect an electric light plant and contemplate the purchase of power, lines, poles, machinery, etc.

MEMPHIS, TEX. — The plant of the Texas Gas & Electric Company, recently destroyed by fire, will be rebuilt by F. Miller of Hollis, Okla., who has purchased the franchise and property of the company.

Pacific and Mountain States

OLYMPIA, WASH.—Bids will be received by the State Capitol Commission until Oct. 12 for the installation of a lighting system for the Temple of Justice and the new state office buildings.

HILLSBORO, ORE.—The Federal Telegraph Company, F. H. Barstow, local manager at Portland, contemplates the erection of a wireless station. Plans include a 620-ft. tower to hold six sets of antennas, etc. The cost is estimated at about $200,000.

REDLANDS, CAL. — A committee has been appointed by the South Mesa Water Company of the Yucaipa Valley to investigate and report on the matter of erecting its own power plant.

SAN DIEGO, CAL.—Bids will be received by the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Oct. 20, for the installation of a fire-alarm system.

BROWNING, MONT. — It is understood that plans are under way for the installation of an electric light plant at the local Indian Agency.

BUFFALO, MONT.—The city officials of Miles City, Terry and Glendive contemplate the erection of a hydro-electric plant at Buffalo Rapids. Joseph C. Leighton of Miles City is interested.

GREAT FALLS, MONT. — The Montana Power Company contemplates the installation of wireless telephone systems, connecting at its eleven plants in the state.

Record of Electrical Patents

Notes on United States Patents

(Issued June 8, 1920)

1,342,525. WEB-TENSION BRAKE MECHANISM FOR PRINTING PRESSES; Theodore J. Beregh, New York, N. Y. App. filed July 12, 1919. Adjustable.

1,345,502. SWITCH OR RECEPTACLE BOX; Krantz, Brooklyn, N. Y. App. filed July 19, 1917. Several switch units combined.

(Issued July 6, 1920)

1,345,489. HOLE CLOSURE; Bryson D. Horton, Detroit, Mich. App. filed April 13, 1915. Seals for repeated use in knock-out holes.

1,345,502. SWITCH OR RECEPTACLE BOX William Newton, Lynbrook, N. Y. App. filed Nov. 23, 1916. Means for holding.

1,345,503. SWITCH OR RECEPTACLE BOX; William J. Newton, Lynbrook, N. Y. App. filed Dec. 5, 1916. Position adjustable in outlet box.

(Issued Sept. 28, 1920)

1,353,852. SAFETY MECHANISM FOR ELEVATOR-SHAFT DOORS; Albert J. Rosentreter, Boonton, N. J. App. filed Dec. 17, 1919. Opening door cuts off power.

1,353,869. SYSTEM OF ELECTRICAL DISTRIBUTION; Leonard A. Watson, Brooklyn, N. Y. App. filed Sept. 19, 1919. Car lighting.

1,353,870. SYSTEM OF ELECTRICAL DISTRIBUTION; Leonard A. Watson, Brooklyn, N. Y. App. filed Sept. 19, 1919. For battery and lamp circuit.

1,353,872. TELEPHONE-EXCHANGE SYSTEM; William C. Weaver, East Orange, N. J. App. filed March 25, 1918. Operator-controlled.

1,353,876. STARTING DEVICE FOR INTERNAL-COMBUSTION ENGINES; Hans Weichsel, St. Louis, Mo. App. filed May 23, 1919. Insures forward starting.

1,353,883. DYNAMO-ELECTRIC MACHINE; Thomas Zimmerman, Niagara Falls, N. Y. App. filed Nov. 12, 1915. Compact.

1,353,935. ELECTRICALLY WOUND AND SYNCHRONIZED STRIKING CLOCK; Anton R. Nelson, Susanville, Cal. App. filed March 2, 1917. Uses commercial energy.

1,353,965. ELECTRICALLY HEATED TOOL; Frank Kuhn, Lawrence H. Thomas and Jules G. Spiess, Detroit, Mich. App. filed May 27, 1920. Soldering iron.

1,353,972. ELECTRIC HEATER FOR SEALING WAX; Arthur J. Ording, Chicago, Ill. App. filed Oct. 3, 1919. For applying wax.

1,353,976. VACUUM-TUBE DEVICE; Erwin R. Stoekle, New York, N. Y. App. filed March 20, 1916. High-power.

1,353,983. PHASE-DISTRIBUTION SYSTEM; Thaddeus F. Baily and Frank T. Cope, Alliance, Ohio. App. filed June 27, 1918. Three-phase current for resistance furnace.

1,353,995. ELECTROLYTIC APPARATUS; William E. Greenawalt, Denver, Col. App. filed Jan. 7, 1919. Electrolysis of impure copper solutions.

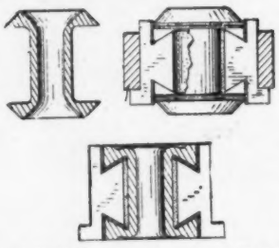
1,354,005. COMMUTATOR AND METHOD OF ASSEMBLING SAME; Sebastian N. Sloan, Maumee, Ohio. App. filed March 3, 1917. Improved clamping.

1,354,006. PROCESS OF MAKING COMMUTATORS; Sebastian N Sloan, Toledo, Ohio. App. filed May 2, 1918. Segments clamped between flanges on ends of barrel.

1,354,007. SPOOL OR HOLDER FOR COMMUTATORS; Charles A. Van Dusen, Toledo, Ohio. App. filed Feb. 24, 1919. One-piece barrel with flanges swaged inwardly to clamp segments.

1,354,020. TELEPHONE SYSTEM; Harry W. Bryce, Downers Grove, Ill. App. filed Oct. 6, 1915. Manually operated link and trunk circuits.

1,354,030. SIGNALING DEVICE; Anderson Dilly, Brooklyn, N. Y. App. filed Nov. 4, 1919. Portable flash.



No. 1,354,006. Process of Making Commutators

1,354,051. CALL-REGISTERING SYSTEM; Alben E. Lundell, New York, N. Y. App. filed Sept. 30, 1918. Telephone.

1,354,074. MACHINERY FOR BALANCING OF UNSYMMETRICAL LOADS WITH POLYPHASE DISTRIBUTION NETS OR SUPPLY MAINS; Hidde K. Schrage, Stockholm, Sweden. App. filed Dec. 22, 1919. By a non-synchronous generator.

1,354,086. STORAGE-BATTERY ELECTRODE OR PLATE; Cornelius Ambruster, Roslyn, Pa. App. filed Sept. 4, 1918. Poured end-connecting bar.

1,354,099. ELECTRICAL TRANSMITTING AND INDICATING APPARATUS; Edward A. Graham, Brockley, London, England. App. filed June 24, 1919. For transmitting orders, numerical data, etc.

1,354,142. ELECTRICAL PROTECTIVE DEVICE; Benjamin H. Smith, Turtle Creek, Pa. App. filed April 5, 1916. Time-limit relay.

1,354,146. CONDENSER; Phillips Thomas, Edgewood, Pa. App. filed Feb. 25, 1919. Heavy duty.

1,354,147. CONDENSER AND METHOD OF MAKING THE SAME; Phillips Thomas, Edgewood, Pa. App. filed March 7, 1919. High-voltage and low-capacity.

1,354,152. RELAY DEVICE; Charles C. Whittaker, Wilkinsburg, Pa. App. filed June 19, 1917. Differentially acting.

1,354,160. ELECTRICAL REGULATOR; Clarence A. Boddie, Pittsburgh, Pa. App. filed March 28, 1917. Holds constant voltage.

1,354,167. CONTROL SYSTEM; Andrew H. Candee, Pittsburgh, Pa. App. filed Aug. 3, 1917. Mining locomotives.

1,354,168. SYSTEM OF CONTROL; John A. Clarke, Jr., Edgewood Park, Pa. App. filed Oct. 3, 1917. Multiple-unit train.

1,354,173. MOTOR-CONTROL SYSTEM; Ray E. De Camp, Wilkinsburg, Pa. App. filed Oct. 6, 1916. For frequent stops and reversals.

1,354,180. MOTOR-CONTROL SYSTEM; Adolph A. Gazda, Wilkinsburg, Pa. App. filed Sept. 30, 1916. For frequent stops and reversals.

1,354,188. CONTROL SYSTEM; Rudolf E. Hellmund, Pittsburgh, Pa. App. filed Feb. 7, 1916. Electric railway.

1,354,229. TELEPHONE TRANSMITTER; George K. Thompson, Maplewood, N. J. App. filed Sept. 21, 1918. High normal resistance.

1,354,234. HOLDER FOR ELECTROPLATING; Harry M. Blaetz, Philadelphia, Pa. App. filed Jan. 17, 1920. Making lead-molding electrotypes.

1,354,255. BATTERY-CELL HYDROMETER; Percy D. Ivey, Guelph, Ontario, Canada. App. filed April 14, 1919. For cells having opaque walls.

1,354,256. BATTERY CELL; Percy D. Ivey, Guelph, Ont. App. filed April 14, 1919. Strong walls.

1,354,257. PROCESS FOR TREATING MINERAL OILS; Walter Johnson, North Loup, Neb. App. filed April 25, 1916. For cracking crude or mineral oil.

1,354,266. METHOD OF ELECTRICALLY WELDING STEEL; John W. Plant, San Mateo, Cal. App. filed April 29, 1919. In neutral atmosphere.

1,354,290. RECEIVER OF WIRELESS SIGNALS; Ernest E. Frank, Helston, England. App. filed June 19, 1920. Separates waves of close frequencies.

1,354,293. SLUG WELDING; James H. Gravell, Elkins Park, Pa. App. filed Aug. 20, 1919. Slug readily located in position.

1,354,312. GENERATOR OF SUSTAINED ELECTRIC WAVES OR OSCILLATIONS; Marius Latour, Paris, France. App. filed Nov. 25, 1916. Of very low intensity.

1,354,323. BATTERY HAND LAMP; Lorenz Maisel, Madison, Wis. App. filed Aug. 26, 1918. New switch.

1,354,347. RINGING-TONE CIRCUITS; Frank M. Slough, Rochester, N. Y. App. filed Dec. 1, 1916. Called subscriber's bell heard by caller.

1,354,388. ELECTRIC MOTOR; Francis C. C. Fox, Sawtelle, Cal. App. filed June 16, 1917. Radical departure in design.

1,354,389. ELECTROMAGNETIC SOUNDING DEVICE; Hugo Gernsback, New York, N. Y. App. filed Dec. 11, 1917. For practising wireless telegraphy.

1,354,396. FASTENING DEVICE; Harry E. Hoenig, East Liverpool, Ohio. App. filed Oct. 20, 1915. Two-part cleat.

1,354,398. WELDING SYSTEM; Claude J. Holslag, South Orange, N. J. App. filed Dec. 13, 1919. Low open-circuit voltage.

1,354,451. MANUFACTURE OF REDUCING ALKALINE MELTS; Einar Bergve, Christiania, Norway. App. filed March 10, 1919. Electrolytic.